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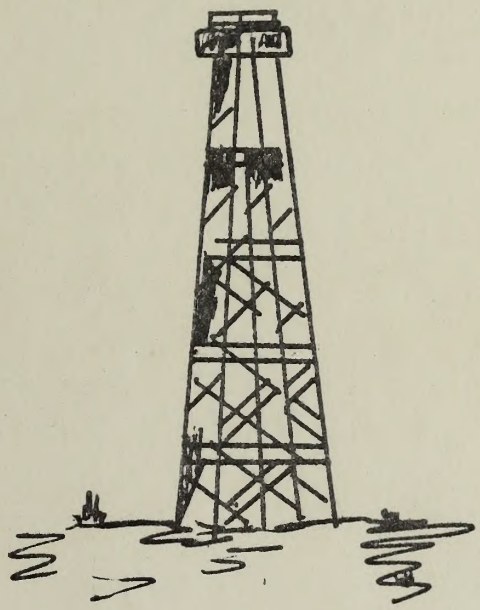
PROPOSED FEDERAL OIL AND GAS LEASING IN WASHINGTON



ENVIRONMENTAL ANALYSIS RECORD

US DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
SPOKANE DISTRICT

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ENVIRONMENTAL ANALYSIS RECORD

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Proposed Federal
Oil and Gas Leasing
in Washington

Bureau of Land Management
Spokane District Office
Room 551, U.S. Court House Building
Spokane, Washington
99201

April 1976

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Wenatchee Nat. Forest Units

Yakima Canyon

Manastash Ridge

Umtanum Ridge

Frenchman Hills

Saddle Mts.

Rattlesnake Hills

Toppenish Ridge

HANFORD WORKS (AEC)

Scale 1:250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

TRANSVERSE MERCATOR PROJECTION

LANDS UNDER LEASE APPLICATION AS OF Feb. 28 1976

Anticline

SECTIONIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

OIL & GAS LEASE APPLICATION MAP I-1

BUREAU OF LAND MANAGEMENT
SPOKANE DISTRICT OFFICE
SPOKANE, WA. 99201

V

I. Description of the Proposed Action and Alternatives

A. Introduction

This environmental analysis record (EAR) will discuss the effects of the proposed leasing for exploration and development of oil and gas resources on the Federal lands and lands of private or state surface ownership where the mineral rights were reserved to the U.S.

As of February 28, 1976, there were 121 lease applications on file with the Bureau of Land Management (BLM) covering 162,225 acres of land in the following counties in Central Washington (see Oil and Gas Lease Application Map I-1).

County	Acres	% of Total
Benton	8,495	5
Grant	37,054	23
Kittitas	56,834	35
Yakima	59,840	37
	162,225	100

Surface Ownership
Administration Under Lease Application

	Acres	% of Total
Private Lands	37,869.61	23.4
Bureau of Land Management (BLM)	42,570.71	26.2
Forest Service (USFS)	37,797.40	23.3
Department of Defense (DOD)	10,939.57	6.7
Bureau of Reclamination (BR)	10,624.17	6.6
Energy Resources & Development Administration (ERDA)	4,655.05	2.9
State of Washington	17,568.51	10.8
Benton County	200.00	0.1
	162,225.02	100.0

The various land management agencies were notified of the receipt, by the BLM, of the applications to lease for the purpose of exploring for oil and gas resources.

The agencies were afforded the opportunity to supply information to the writing of this EAR. All known private land holders were notified by letter of the applications. Some letters of inquiry were returned by private land holders. These letters are on file in the BLM's Spokane District Office.

The U.S. Forest Service supplied information from their Wenatchee National Forest for this report. Their submission is included in the appendix and is reflected in appropriate portions of this report.

An interdisciplinary team of BLM staff members from the Spokane District Office prepared this EAR with assistance and guidance from the BLM Oregon State Office, in Portland.

Information on the land and associated resources in the EAR were obtained from inventories and data furnished by Federal, state, and local agencies and individuals having direct knowledge of the area. The basic data were recorded in BLM inventory documents called Unit Resource Analysis (URA). Land use capabilities and potential resource conflicts are listed in a document called Management Framework Plan (MFP). Together, the two documents have inventories, conditions, uses, production, quality and management potentials for defined geographic areas of BLM administered lands. The Yakima River, Saddle Mountain, Rattlesnake, Johnson Creek, and South Clockum URA's and MFP's contain information pertinent to this EAR. These documents are available for review at the Spokane District Office.

B. Proposed Action

The proposed action is the leasing of national resource land (NRL), private and state lands on which the United States retained the mineral rights, and other federally controlled lands, within the State of Washington, for exploration and development of the oil or natural gas deposits that may be located beneath or adjacent to these lands. This environmental report analyzes the impact that this action would have upon the environment.

Subject lands are located in south central Washington in Grant, Benton, Yakima, and Kittitas Counties as per Map I-1. These lands are not part of a known geological structure of a producing oil or gas field. The proposed leases would be let without competitive bidding as directed under Public Law 86-705 of September 2, 1960, an act to amend the Mineral Leasing Act of February 25, 1920. Under this act as amended (41 Stat. 437, 30 USC-181 et seq.) and the Acquired Lands Mineral Leasing Act of August 8, 1947, (61 Stat. 913, 30 USC 351-359) provision was made that oil and gas leases on Federal lands, both public and acquired, be issued by the Department of Interior, General Land

Office, now the Bureau of Land Management. This same responsibility extended to oil and gas reserved to the U.S. in lands transferred out of Federal ownership. The lands proposed for lease would be administered under regulations in 43 CFR 3100 and applicable sub parts.

After a lease is issued but before the lessee is permitted to drill a well, he must submit an application for a permit to drill and a surface use plan to USGS. Before a permit to drill is issued, USGS prepares an environmental analysis. USGS confers with the land-administering agency during the preparation of the analysis. The land-administering agency may also prepare an environmental analysis at that time. If oil or gas is discovered and the lessee proposes to drill additional wells, he must submit additional drilling permit applications and development plans for approval by USGS.

Department of the Interior Secretarial Order 2948 and the "Cooperative Procedures Pertaining to Onshore Oil, Gas and Geothermal Resources Operations" (implementation of Secretary Order 2948) set up a division of responsibility between the BLM and USGS for administration of the mineral leasing laws, onshore. These documents plus 43 CFR 3100, BLM manuals, releases, and pertinent instruction memorandums are on file in the Spokane District Office.

C. Alternatives to Proposed Action

Alternatives to the proposed action include: (1) prohibition of surface disturbance or occupancy on specific tracts and (2) disapproval of leasing for oil and gas exploration on all tracts. These alternatives will be discussed further in Section III, Analysis of Proposed Action and Alternatives.

D. Procedures for Environmental Protection

The following is a summary of procedures for the environmental protection of lands under application for oil and gas leasing, as provided in BLM manual releases, instruction memo's and directives:

1. Applications to lease are received by the BLM.

2. BLM uses the National Environmental Policy Act (NEPA) review process to analyze the effects of the action in relation to the human environment.

3. If the initial review or EAR does not indicate any significant impact, the lease can be issued if all other requirements have been met.

4. If the initial review does indicate a significant impact, an Environmental Impact Statement (EIS) would be recommended.

5. If an EIS were necessary, a decision to issue the lease would not be implemented until 30 days after the final EIS had been released. A draft would be prepared, then circulated for comment to interested agencies, groups and individuals.

6. Following receipt of comments, a final EIS is made. Thirty days after issuance of the final EIS, the lease could be issued if all other requirements have been met.

7. When the lease is executed, it is turned over to USGS for administration.

8. Before any surface disturbing activity is authorized, the lessee and surface owner, in consultation with the appropriate land management agency, must prepare a written plan of operation which is submitted to the USGS.

9. USGS reviews the proposed plan of operations for technical aspects of the oil and gas operations and for impacts those proposed operations might have on the environment. USGS coordinates this review with BLM, Lessee, and surface owner or administrator.

10. USGS goes through the NEPA review process, including preparation of an EAR or EIS, as appropriate, before approving the lessee's plan of operations.

11. Revisions or additions to the approved plan of action are handled the same as the initial plan of action review, including the EAR or EIS, as appropriate, before approving the lessee's revision or addition.

12. Each time a NEPA review is made, special mitigating stipulations can be added to the plan of operation to protect the environment. These mitigating measures must be enforceable and not arbitrary.

13. If necessary mitigating measures are so extreme that the implementation renders a lease impractical, the lease application will be denied. In such an extreme situation, if a lease has already been issued, there are provisions to provide the lessee with compensatory damages. If a proposed plan of operation would cause unacceptable environmental impacts, BLM and USGS would work with the lessee to adopt an alternative plan.

E. STAGES OF IMPLEMENTATION

Four separate stages of implementation have been identified:

1. Exploration - Includes all activities from the decision to explore for an oil or gas field through the drilling of one or more "wildcat" or exploration wells. The discrete operations are:

   a. Preliminary investigations
   b. Seismic surveys
   c. Exploratory drilling
   d. Rehabilitation

2. Development - This is the period of most intense activity.

   a. Drill site development
   b. Drilling procedures
   c. Construction of flow lines or storage and treatment facilities (if oil is found)
   d. Rehabilitation

3. Operation - This phase is principally the production and maintenance interval. It includes the following discrete operations:

   a. New drill sites
   b. Maintenance of existing facilities
   c. Waste disposal
   d. Production

4. Close-Out - This interval is the site abandonment phase. The discrete operations are:

   a. Removal of surface equipment
   b. Capping drill holes and wells
   c. Surface restoration and reclamation
   d. USGS returns administration of site to BLM

F. Lease Applications

As of this writing the BLM has 121 lease applications for oil and gas exploration in Washington. The information received to date indicates the serialized numbers assigned and a legal description of the land involved. At the writing of this EAR these applications are in the process of adjudication to determine ownerships involved and mineral rights. Some of the applications will be denied for various legal reasons; the balance will become pertinent to this EAR. The adjudication is being done by Oregon State Office. This EAR deals in the general relationships affecting these lands as a group.

If leases are issued and a lessee decides to drill an exploratory well, USGS in consultation with the appropriate surface management agency, or surface owner, will prepare a site specific environmental analysis before issuing a drilling permit.

This document directs itself to the 121 serialized lease applications received as of February 28, 1976.

A supplemental EAR will be written on areas having unusual circumstances and needing separate treatment.

This procedure will be used for forthcoming applications that may be received during calendar year 1976 for the lands covered in this analysis.

The serialized applications that have been received as of this writing are included in the appendix.

G. History of Oil Exploration in Washington

Most of the discussion on Washington petroleum and natural gas that follows has been extracted from "Mineral and Water Resources of Washington" (U.S. Geological Survey, and others, 1966, p. 287-297) which was printed for the use of the Committee on Interior and Insular Affairs, United States Senate. Data from the report have been revised in places to add more recent information. The following is taken from "Energy Resources of Washington", Washington State Department of Natural Resources, Division of Earth Resources, Circular No. 50, 1974, Pages 67-80.

TABLE I-2

Compilation by Company Making Application

Number of Active Lease Applications as of February 28, 1976: 121
Total Acreage of Oil and Gas Lease Applications: 162,225

	COUNTY							
	YAKIMA		KITTITAS		GRANT		BENTON	
	Number	%	Number	%	Number	%	Number	%
Lease Applications	51½	42.5	37	30.6	23	19.0	9½	7.9
Shell Oil	35	68.0	17	46.0	21	91.3	8	84.2
Texaco	2	3.9	9	24.3	0	0	0	0
Puckett	4½	8.7	2	5.4	2	8.7	½	5.3
Yates	10	19.4	8	21.6	0	0	1	10.5
Holcomb	0	0	1	2.7	0	0	0	0
Application Acreages	59,840.12	36.9	56,834.68	35.1	37,054.64	22.8	8,495.15	5.2
Shell Oil	45,331.73	75.7	21,318.99	37.5	36,576.33	98.7	7,146.26	84.2
Texaco	1,120.60	1.9	21,701.65	38.2	0	0	0	0
Puckett	6,379.23	10.7	4,858.53	8.5	478.31	1.3	513.88	6.0
Yates	7,009.16	11.7	8,635.51	15.2	0	0	835.01	9.8
Holcomb	0	0	320.00	.6	0	0	0	0

PETROLEUM AND NATURAL GAS

Exploratory test wells in the State of Washington have disclosed evidence of petroleum and natural gas in more than 100 wells, but only minor production of these commodities has been obtained and neither is yet economically important. Solid hydrocarbons have been found only in small local occurrences, and no sedimentary rocks classifiable as oil shale are known in the state. Nevertheless, Washington contains within its confines areas that possess the three geologic characters that are required for the accumulation of commercial quantities of petroleum and natural gas. These are as follows:

(1) An adequate source of petroleum-generating material in the form of abundant marine animal or plant life.

(2) The presence of reservoir rocks in which important amounts of oil and gas can accumulate and from which they can be made to flow to wells for production at satisfactory rates.

(3) Suitable structural or stratigraphic conditions that provide a means of localizing and entrapping the oil or gas in the reservoir rocks.

Whether these three factors are to be found in a combination that would provide major commercial production of petroleum has yet to be determined definitely in Washington, although surface and subsurface indications are favorable in many areas. The most obvious indications of the presence of petroleum and natural gas are oil seeps and gas at the surface of the ground. Such seeps have been reported in several places along the west and north coasts of the Olympic Peninsula, at two localities adjacent to Willapa Bay in southwestern Washington, in the vicinity of Bellingham in Whatcom County, near Wenatchee in southern Chelan County, and near the Columbia River in southern Skamania County. These areas containing oil seeps were among the first to be prospected. In searching for other areas to test in Washington, the petroleum geologist must search for less obvious indications and must use basic geologic data gained through geologic and geophysical mapping, and test drilling. Many anticlinal structures suitable for oil accumulation have been mapped in Washington, and many that have been tested by drilling have had promising shows of oil and gas. Many similar structures are probably present but are hidden beneath the thick cover of sand and gravel deposited in glacial times, are obscured by the dense vegetation, are buried under the great basalt flows of the Columbia Basin, or are concealed beneath the Pacific Ocean on the Continental Shelf.

The oil and gas possibilities of different parts of the State of Washington are dependent principally upon the types of rocks underlying the land surface. Intrusive igneous rocks, such as granite, and extrusive igneous rocks, such as basalt, in themselves afford practically no possibility for commercial petroleum production. Strongly metamorphosed rocks, whether originally sedimentary or not, have generally undergone such radical changes that they have retained little potential as petroleum producers. In general, only those areas that are underlain by marine sediments, and specifically, dark-colored organic-rich shales and porous sandstones, can be considered as good prospects for petroleum generation and accumulation. Consideration must, however, be given to the possibility of petroleum production from marine strata that underlie sediments of continental origin or thick sequences of basalt where adequate stratigraphic traps or structural closures exist.

On page 12 is depicted a much generalized geologic map of Washington on which the wells drilled to January 1973 for petroleum are shown and on which the underlying rock has been grouped into categories that can be used to discuss the petroleum potential of the six major physiographic regions of Washington. These regions are the Okanogan Highlands, the Columbia Basin, the Cascade Mountains, the Puget Lowland, the Olympic Mountains, and the Willapa Hills. Each region possesses many distinctive geologic characteristics which in turn affect the petroleum potential of the area.

(Since this report deals only with the Basin Area, the sections on the Cascade Mountain, the Okanogan Highlands, Puget Lowlands, Willapa Hills and the Continental Shelf discussions have been omitted.)

COLUMBIA BASIN

The Columbia Basin occupies approximately the southeastern quarter of Washington. It lies south of the Okanogan Highlands and east of the Cascade Mountains, and extends southward far into Oregon and eastward into Idaho to the foothills of the Rocky Mountains. The Basin is underlain mainly by basaltic lava flows. In many places later sedimentary rocks of continental origin overlie the basalt and are in turn overlain by gravels, sands, silts, and clays of recent age. Smaller local deposits of sediments intercalated within the lava flows probably accumulated in temporary shallow depressions caused by the damming of stream valleys by lava. The lava flows rise gradually toward the southwest onto the broad north-south slopes of the southern part of the Washington Cascades.

The basaltic lavas of the Columbia River Group lie in a shallow downwarp into which at least 10,600 feet of lava was extruded. Toward

the margin of the basin the number of flows and the total thickness become progressively less. The volcanic rocks in the western part of the basin have been folded into several asymmetric ridges that trend northwest-southeast or east-west generally with low dips on the south and steep to overturned dips to the north. These ridges are where oil and gas applications are filed.

The lithologic character of the rocks on which the basalt of the Columbia Basin rests is of importance in considering the possibilities of obtaining oil or gas in this region. Along the entire northern boundary of the plateau and southward along the state's eastern boundary to the southeastern corner the basalt flows rest on argillite, schist, crystalline limestone, and quartzite or on granite and similar intrusive rocks. Presumably these metamorphic and igneous rocks extend south and west considerable distances beneath the lavas of the plateau. Along the western margin the lavas lap onto a floor composed generally of folded older lavas and continental sedimentary rocks; sheared argillite, graywacke, and altered lava flows crop out in a small area in western Yakima County. The subsurface extent of these continental sediments is unknown, but it is possible that they may extend southeast to the Rattlesnake Hills area. Along the southern boundary of the state, the Columbia River has failed to cut through the basalt cover and nothing is known concerning the underlying rocks. In the western part of the Columbia Basin, parts or all of Chelan, Douglas, Grant, Kittitas, Yakima, Klickitat, Adams, Franklin, Walla Walla, and Benton Counties may be underlain in the subsurface by sedimentary rocks possibly productive of petroleum if the structural conditions are favorable.

The Columbia Basin area is not, however, barren of petroleum indications or products. In 1913, a well that was being drilled for water on the northeast slope of the Rattlesnake Hills in northern Benton County encountered a flow of gas estimated at between 70,000 and 500,000 cubic feet per day under about 5½ pounds per square inch pressure. The Rattlesnake Hills gas field, located on a faulted anticline was not immediately developed, but by 1936 fifteen wells were in production and nearly a billion cubic feet of gas had been distributed to seven towns in the Yakima Valley. The gas came from porous vesicular zones in the basalt at depths of 700 to 1,260 feet. Analysis of the gas showed an average nitrogen content of nearly 10 percent, a small amount of oxygen, no ethane or heavier hydrocarbons, and an average methane content greater than 80 percent. The source of the gas is unknown, but the very high methane content and presence of substantial nitrogen suggest a vegetal origin. The Rattlesnake Hills gas field was abandoned in 1941. In 1958 an attempt was made in that area to drill through the basalt to determine the presence or absence of marine

strata. At the total depth of 10,655 feet the bit was still drilling in volcanic rock; but chemical, lithologic, and electric log data suggest that the Columbia basalt flows were drilled through at about 4,000 feet and that the hole bottomed in volcanics of older age.

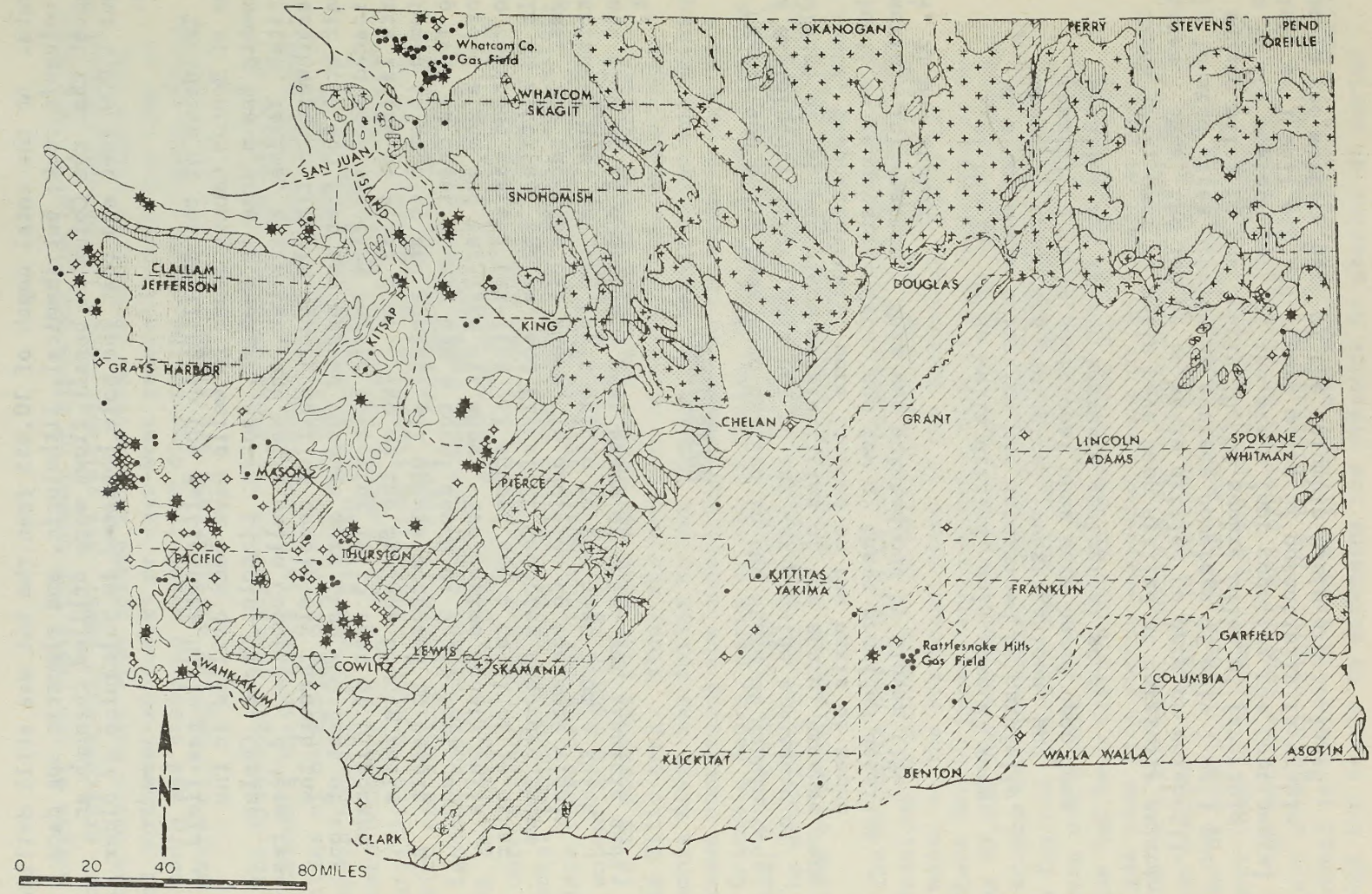
Exclusive of the drilling in the Rattlesnake Hills gas field area of Benton County about 25 wells have been drilled in the Columbia Basin area in Spokane, Asotin, Lincoln, Grant, Chelan, Kittitas, Yakima, Klickitat, and Walla Walla Counties. A deep test in southwestern Lincoln County drilled completely through the basalt at 4,465 feet and passed through more than 200 feet of consolidated sand and clay before bottoming in 15 feet of Oligocene quartz latite at 4,682 feet. Two of the Spokane County wells bottomed in granite and gneiss; all others bottomed in basalt. A deep test in Grant County has a total depth of 4,575 feet, and recorded a gas and tar-like oil show. Two Yakima County wells also recorded gas and tar-like oil shows; and a total of 14 other wells in Kittitas, Yakima, and Klickitat Counties recorded shows of gas. The tar-like oil shows, in addition to the more widely distributed gas, may owe their origin to the heat from a thick basalt flow as it overrode a peat swamp or thin, wet lignitic sediment.

CONCLUSIONS

Nearly 400 wells have been drilled in the State of Washington; this exploratory effort does not in any way provide a measure of knowledge of the petroleum possibilities of the state, because very few tests, proportionately, were located on the basis of sound geologic or geophysical data, and few of these provided detailed subsurface information. This was pointed out by Glover (1947, p. 4, 5) who stated:

> ...of the 244 or so wells drilled, only some 27 were at sites whose selection was determined by carefully, properly conducted geological investigations, and possibly 6 to 10 additional ones were based upon less detailed but fairly adequate geological study...

Since 1947, over 75 wells have been drilled at carefully selected sites. Thus, the 100 or so wells drilled to date on scientifically located sites provide an average coverage of only 1 well per 100 square miles in the nearly 10,000 square miles of favorable area in the western part of the state (not counting the Continental Shelf), or 1 well per 200 square miles if potentially favorable areas in the western part of the Columbia Basin are included.

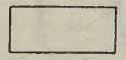


Location of Exploratory Wells in Washington

Map- I-3 Washington State Department of Natural Resources - "Energy Resources of Washington" Information Circular No. 50

EXPLANATION

EXPLORATORY WELLS: ✸ Greater than 5,000 feet deep ✧ 2,000 feet to 5,000 feet deep • Less than 2,000 feet deep; core holes and most wells less than 500 feet not shown



FAVORABLE

Tertiary sedimentary rocks

Areas in which most commercial oil and gas discoveries will be made; underlain by thick sequences of Tertiary marine and nonmarine strata (stipple = nonmarine); includes Continental Shelf, Juan de Fuca Strait, and Puget Sound

FAVORABLE AND UNFAVORABLE UNDIFFERENTIATED

Tertiary volcanic rocks

Areas in which sedimentary rocks of possible petroleum potential or metamorphic and igneous rocks of no potential are covered by surficial volcanic rocks of variable thickness (stipple = pre-middle Miocene volcanic rocks)

UNFAVORABLE

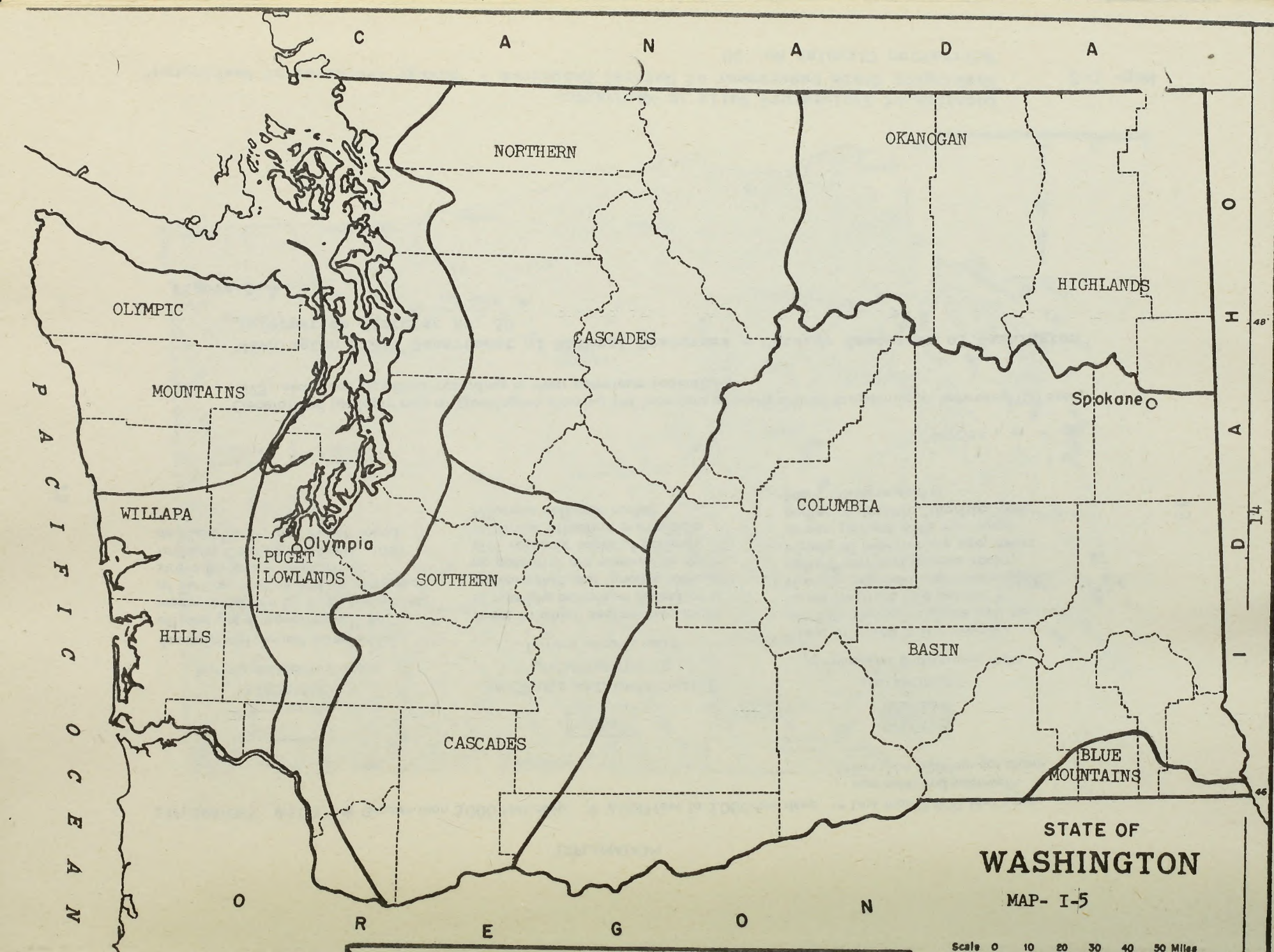
Metamorphic and intrusive rocks

Areas in which it is extremely unlikely that oil and gas will be found (vertical line pattern = strongly or weakly metamorphosed sedimentary and igneous rocks, mainly of pre-Tertiary age; dense screen pattern with + = large bodies of granitic, dioritic, and basic intrusive rocks)

Generalized geologic map of Washington showing the locations of wells drilled for petroleum between 1900 and 1973, and areas classified according to their petroleum potential.

Washington State Department of Natural Resources - "Energy Resources of Washington" Information Circular No. 50

Figure-I-4


C A N A D A
NORTHERN
OKANOGAN
HIGHLANDS
OLYMPIC
MOUNTAINS
CASCADES
Spokane
COLUMBIA
WILLAPA
HILLS
Olympia
PUGET
LOWLANDS
SOUTHERN
BASIN
CASCADES
BLUE
MOUNTAINS
P A C I F I C O C E A N
I D A H O
O R E G O N
48°
46
STATE OF
WASHINGTON
MAP- I-5
Scale 0 10 20 30 40 50 Miles

It is certain that exploratory tests spaced closer than an average of one well per each 100 or 200 square miles must be drilled before the petroleum resources of this region of poor exposures and complex structure and stratigraphy can be adequately appraised. The gas field in Benton County has proven that sources of petroleum are present. Future test drilling alone can establish whether or not oil and gas in commercial quantity occurs in Washington State. However, the possibility of oil and gas discovery in the Columbia Basin area would appear to be very slight.

H. Federal Oil and Gas Leasing Procedures

Roles of Bureau of Land Management and U.S. Geological Survey

BLM administers Federal laws and regulations relating to mineral resources on land under its primary jurisdiction, Federal lands withdrawn for other agencies, acquired Federal lands, and Federal mineral reserves in private lands. BLM, in consultation with the USGS, determines whether, and the conditions under which, Federal oil and gas leases will be issued. If the lands being considered for leasing are withdrawn for another Federal agency, that agency is involved in the process of determining whether the land will be leased and under what conditions.

After leases are issued on lands administered by BLM, the USGS, in consultation with BLM, administers oil and gas operations on the leases. The USGS is responsible for maintaining engineering, geologic, geophysical, economic, and other technical expertise needed to assure compliance with applicable laws, regulations, and Departmental objectives. BLM and USGS responsibilities for administration of oil and gas operations on Federal leases are described in Secretarial Order 2948 and the implementing working agreement.

Administration of Geophysical Explorations

Geophysical explorations normally are conducted before an oil and gas lease is obtained but are not necessarily preconditions to obtaining a lease. The procedures are described here to provide an overview of the full range of administrative activities relating to oil and gas operations on Federal lands.

If an operator wants to conduct geophysical explorations on BLM administered lands, he must file a notice of intent with the appropriate BLM district before he enters the land (43 CFR 3045). This regulation does not pertain to lands where the

Federal government owns the mineral rights but not the surface rights. When he signs the notice of intent form, the geophysical operator agrees to conduct the exploration activities according to standard terms and conditions designed to minimize adverse impacts and to contact the District Manager prior to actual entry upon the land. See Appendix for a copy of the notice of intent form, terms and conditions. The operator must also file a bond before entering the land.

When a notice of intent is received, a district staff specialist reviews the proposed operation and may meet with the operator in an effort to minimize the environmental effects of the surveys.

Upon completion of operations, the operator must restore the area as nearly as practicable to its original condition or as specified in the plan of operation specifications.

BLM's land use planning process constrains and guides oil and gas leasing on NRL. Oil and gas production is one of many possible land uses considered in the Bureau's planning system. After the public has had an opportunity to contribute ideas and suggestions on how the land should be managed, a management framework plan is developed. The management framework plan indicates how land uses in the planning area will be coordinated and identifies constraints and parameters for future actions taken in the area.

Management framework plans are being prepared for the NRL with oil and gas applications. Land use planning is a dynamic process, and the MFP will be revised and updated as the need arises.

Before a decision is made on whether oil and gas leases will be issued in a specific area, BLM prepares an EAR. The USGS prepares an environmental analysis before it issues a permit authorizing an oil and gas lessee to drill a well or enter the land for other purposes. BLM may also prepare an EAR on a drilling permit application.

The EAR describes the setting in which the action is to occur, possible environmental impacts of the proposed action, possible alternatives, and measures to reduce adverse impacts of the proposed action.

Information gathered in the land use planning and EAR processes and other data are used by BLM to determine whether oil

and gas leases will be issued for specific lands and, if so, the special conditions or stipulations to which the prospective lessee will have to agree prior to the issuance of the lease. Most of the special stipulations in oil and gas leases issued in recent years relate to the prevention or mitigation of unfavorable environmental impacts. The actual language of these stipulations is determined cooperatively by the land administering agency and USGS.

All oil and gas leases issued by BLM at the present time contain an open-ended set of stipulations. The stipulations are included on BLM Form 3109-5; a copy is included in the Appendix. These stipulations insure that after the lease is issued, USGS and BLM have additional opportunities to specify measures the lessee must take to protect environmental values.

Oil and gas leases may also contain additional stipulations. These stipulations, which may be site-specific, are developed individually for each lease area. Lists of examples of site-specific stipulations are included in the Appendix.

The following measures to protect cultural resources are a standard element of the pre-leasing procedures carried out on all oil and gas lease applications in Washington.

The first step is a review of existing archeological and historical data:

The State Historic Preservation Officer is contacted to determine if any property on, or nominated to, the National Register is located in the area.

Professional journals, books, monographs and site inventories at museums, universities and colleges, historical societies, and other Federal, state and private agencies are consulted to determine if any cultural resources are present in the area.

Professionals and laymen who are knowledgeable about cultural resources that may be present in the areas to be effected are consulted.

If cultural resources that are judged to be significant are known to exist, a determination is made as to whether the tract should be deleted from a proposed lease. If it is determined that the adverse effects of oil and gas development can be adequately mitigated, the resources are described and the

impact analysis and proposed mitigating measures are documented in the EAR. If a site eligible for inclusion in the National Register is involved, the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be given an opportunity to comment on the proposed mitigation measures.

Special lease stipulations may require the lessee to employ a qualified archeologist acceptable to the Authorized Officer to conduct intensive inventories of all areas likely to be disturbed before any surface disturbing activities can be carried out. Lease stipulations may also provide that when cultural resources are identified in the surveys, the lessee will be required to avoid, mitigate the impact upon, or salvage the resources under a program acceptable to the Authorized Officer.

Special stipulations to the lease may also require the operator to stop activities if cultural resources are discovered during operations and to engage a qualified archeologist acceptable to the Authorized Officer to evaluate the materials. If the materials are judged by the archeologist to be significant, the Authorized Officer may require the lessee to take mitigating measures including, but not limited to, salvage, protective measures, or avoidance of the site.

Before a lease is issued, a classification report is prepared to determine whether the lease will be issued on a competitive or noncompetitive basis. Competitive leases are issued within known geologic structures (KGS's) and noncompetitive leases are issued outside KGS's.

No KGS's have been identified in the lease application area.

The USGS prepares a classification report on noncompetitive oil and gas lease applications to determine whether all or any parts of the area applied for are within a KGS. An area is classified as being within a KGS if it is within the trap of a producing oil and gas field as best as can be determined from the geologic data available at the time.

If a tract has not been previously leased, a lease is issued on a non-competitive basis to the first qualified applicant, if USGS determines that it is not in a KGS, and if BLM determines through the land use planning and EAR processes that oil and gas development is an acceptable and appropriate land use.

When leases outside KGS's expire, terminate, are relinquished or cancelled, land use plans, stipulations and EAR's are reviewed to determine whether the tracts should be reoffered for leasing. The tracts are reoffered by being posted on a monthly list. All applications for the posted tracts received during the filing period are considered to have been filed simultaneously. A public drawing is held, and one application is drawn for each tract. If there are no simultaneous applications for a tract, it becomes available to the first application submitted subsequent to the drawing. Noncompetitive leases are currently issued for a primary term of 10 years.

Since Washington has no KGS areas at this time, no competitive leasing is scheduled in the state.

Lessees must furnish bonds conditioned upon compliance with the lease stipulations. Bonds must be furnished before a competitive lease is issued and before a drilling permit is issued on a noncompetitive lease. When past lease procedures are followed during the term of the lease, the USGS supervises operations of the lessee in that portion of the lease tract within the "area of operations" (AO). For wells two or more miles from a producing well, the "AO" is 160 acres for oil wells and 640 acres if a gas test well. (See Secretarial Order 2948 in Appendix for a definition of the area of operations.) The USGS asks BLM for recommendations on surface protection and rehabilitation measures before the USGS acts on requests from lessees for approval of plans for drilling or other operations. BLM administers the oil and gas leasing regulations and terms of the lease in that portion of the lease tract outside the area of operations.

The "open-ended" lease stipulation (Form 3109-5) requires the lessee, prior to entry upon the land, to submit for approval to the USGS a map and surface use plan explaining the nature of the anticipated activity and surface disturbance. The lessee also submits this information to BLM. If the lessee proposes to conduct any activities which would disturb the environment, he will be required to obtain approval from the USGS at least once during the life of the lease. If he finds oil or gas and wishes to drill additional wells to develop the field or construct facilities needed to reach full production, he will be required to return to the USGS for approval of plans of operation for each new stage of development. The information the lessee must furnish in the surface use plan is listed in the USGS's Notice to Lessees number 6 (NTL-6).

For all exploratory well proposals, the USGS prepares an environmental analysis in consultation with the appropriate

surface managing agency. If BLM so requests, the USGS will also hold a joint field inspection with the operator and BLM to analyze the environmental impacts of the proposed action. Stipulations are attached to the drilling permit to minimize adverse environmental impacts. The lessee may be asked to change the proposed well site if drilling in the original location would have severe environmental impacts.

If oil or gas is discovered, lessees are required to submit additional lease development plans and drilling permit applications to the USGS for approval. After review by the USGS, in consultation with BLM and other interested parties, the proposed lease development plans are modified to insure proper construction methods are followed. The lessee is required to prepare for contingencies such as fires, accidents, blow-outs, spills, and leaks, and to notify various state and Federal agencies, such as the Environmental Protection Agency (EPA), in the event of an oil leak or spill.

The USGS is responsible for final approval of abandonment operations when oil and gas operations are terminated. The USGS will not approve the abandonment unless reclamation is carried out to the satisfaction of BLM. When abandonment or cessation of operations results in expiration, cancellation, or relinquishment of the lease, the USGS requests BLM to inspect the leasehold area for compliance with the surface protection and reclamation stipulations in the lease and drilling permit. The lessee is required to reclaim the area insofar as practicable to its condition prior to the oil and gas operations.

I. Summary of Standard Mitigating Measures

The sections on Federal leasing procedures and state regulations of oil and gas operations refer to regulations and standard notice forms and stipulations which would apply to all geophysical explorations for oil and gas, or activities of oil and gas lessees, on Federal lands in Washington. The notice forms, stipulations, and regulations are summarized below and are included in the Appendix.

These are standard procedures which would be implemented in all cases and serve as part of the base upon which the analysis of anticipated impacts is built.

"Notice of Intent to Conduct Oil and Gas Exploration Operations," BLM Form 3040-1. Geophysical exploration companies are required to complete this form before conducting geophysical operations on the NRL. The form contains terms and conditions under which the operations must be conducted. More detailed conditions may be established to meet the unique requirements of the area where operations will be conducted.

Section 2, paragraph (q) of the Federal Oil and Gas Lease Form (BLM Form 3120-7), "Protection of Surface, Natural Resources, and Improvements."

BLM Form 3109-5, "Surface Disturbance Stipulations." These are the "open-ended" stipulations previously referred to. They are made a part of each oil and gas lease issued by BLM at the present time. These stipulations insure that, after the lease is issued but before drilling operations are started, USGS and BLM have additional opportunities to establish conditions which the lessee will have to meet.

"Cultural Resource Stipulation to Oil and Gas Leases." This is the cultural resource protection stipulation included in all oil and gas leases issued in Washington at the present time.

30 CFR 221. These are the Geological Survey's Oil and Gas Operating Regulations. Among other things, they include requirements relating to well casing, well abandonment, and other mitigative measures.

Geological Survey Notices to Lessees and Operators of Federal Oil and Gas Leases. Notices to lessees and operators ("NTL's") transmit the Geological Survey's operating requirements to lessees.

(1) Proposed NTL-2B prescribes requirements for the handling, storing, and disposal of water produced from oil and gas wells.

(2) NTL-3 requires lessees to report discharges of pollutants and accidents and prescribes the contents of the reports.

(3) NTL-4 requires lessees to pay royalties on oil and gas lost because of blowouts, fires, or other reasons.

(4) Proposed NTL-6 formalizes the requirement by USGS that an oil and gas operator furnish a surface use and operating plan to USGS and BLM and receive approval before entering the lease to conduct drilling operations. USGS and BLM use information in the surface use plan and other data collected by the agencies to develop environmental protection measures. The measures are included as conditions of the drilling permit issued by USGS.

40 CFR 112. These U.S. Environmental Protection Agency regulations identify procedures, methods, and equipment to be used to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into navigable waters. The regulations apply to owners and operators of facilities engaged in oil and gas drilling, producing, gathering, storing, and other non-transportation-related activities. Oil and gas operators are required in the regulations to prepare a "Spill Prevention Control and Countermeasure Plan."

40 CFR 1510. These Environmental Protection Agency regulations contain the "National Oil and Hazardous Substances Pollution Contingency Plan." As stated in the regulations, the plan...

> provides for a pattern of coordinated and integrated response by Departments and Agencies of the Federal Government to protect the environment from the damaging effects of pollution discharges. It promotes the coordination and direction of Federal and State response systems and encourages the development of local government and private capabilities to handle such discharges.

In addition to these Federal regulations, stipulations, and administrative procedures relating to Federal lands, all oil and gas operations in Washington would be subject to state laws and regulations regarding pollution control. The Washington State regulations and stipulations are included in the Appendix.

I. Exploration and Development-Oil and Gas

1. How the Areas to be Drilled are Selected (1).

It is the operating company that decides where a well is to be drilled. Decisions are based upon (1) the probabilities of finding hydrocarbons in a specific location as indicated by geologists and geophysicists, (2) the company holding satisfactory leases or agreements granting drilling and production rights, and (3) the availability of funds for the specific well.

The first of these utilizes a wide range of scientific research, methods and inventions to locate possible oil bearing locations. Exploration data are reviewed and evaluated. For the second consideration, lease terms and agreements are thoroughly examined by legal experts for clear title and rights-of-way for access, and exact boundaries and locations are established or confirmed by surveyors. In the third instance, corporate financing, loans, and private risk capital sources are employed for the necessary funds to pay for drilling a well.

Oil and gas are found where irregularities exist in subsurface strata. Movement of the earth's crust during geologic eras has caused faults, folds, and domes to form, see **figures I-6 and I-7.**

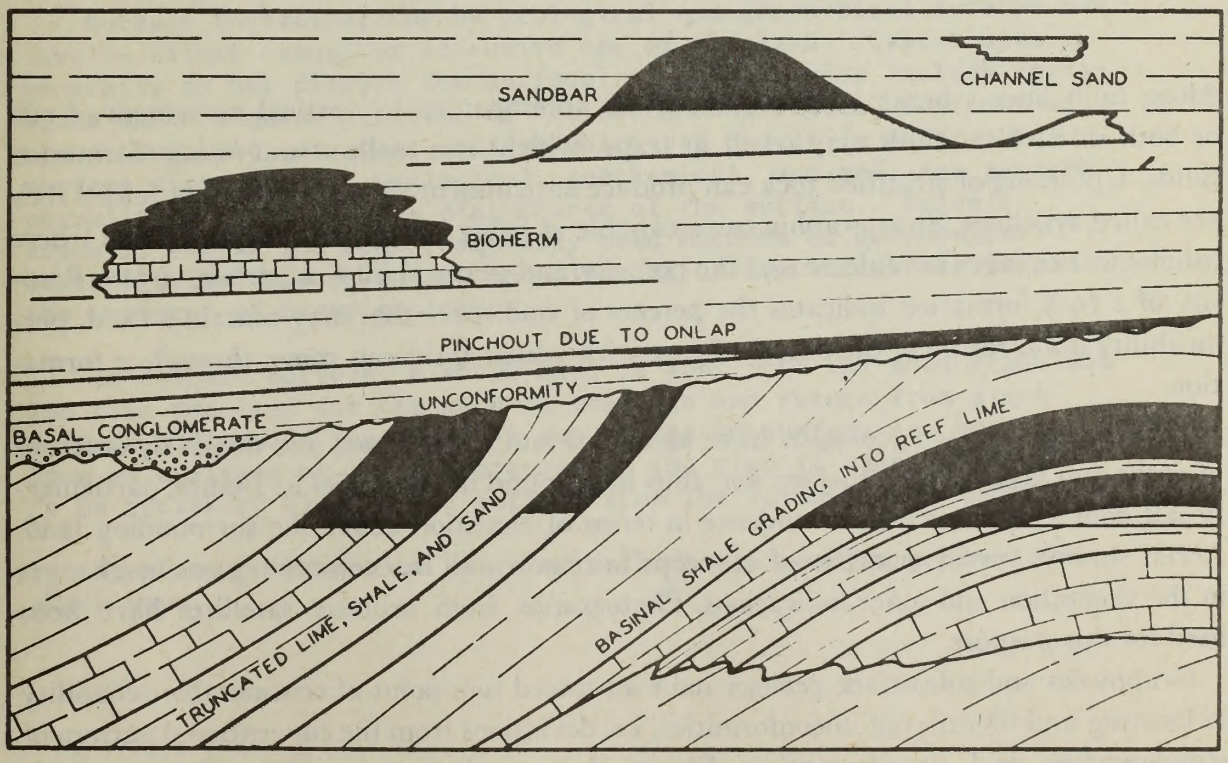


Figure- I-6 Common types of stratigraphic traps.

(1) Reprinted from "A Primer of Oil Well Drilling" by permission of the Division of Extension, The University of Texas, at Austin, Texas.

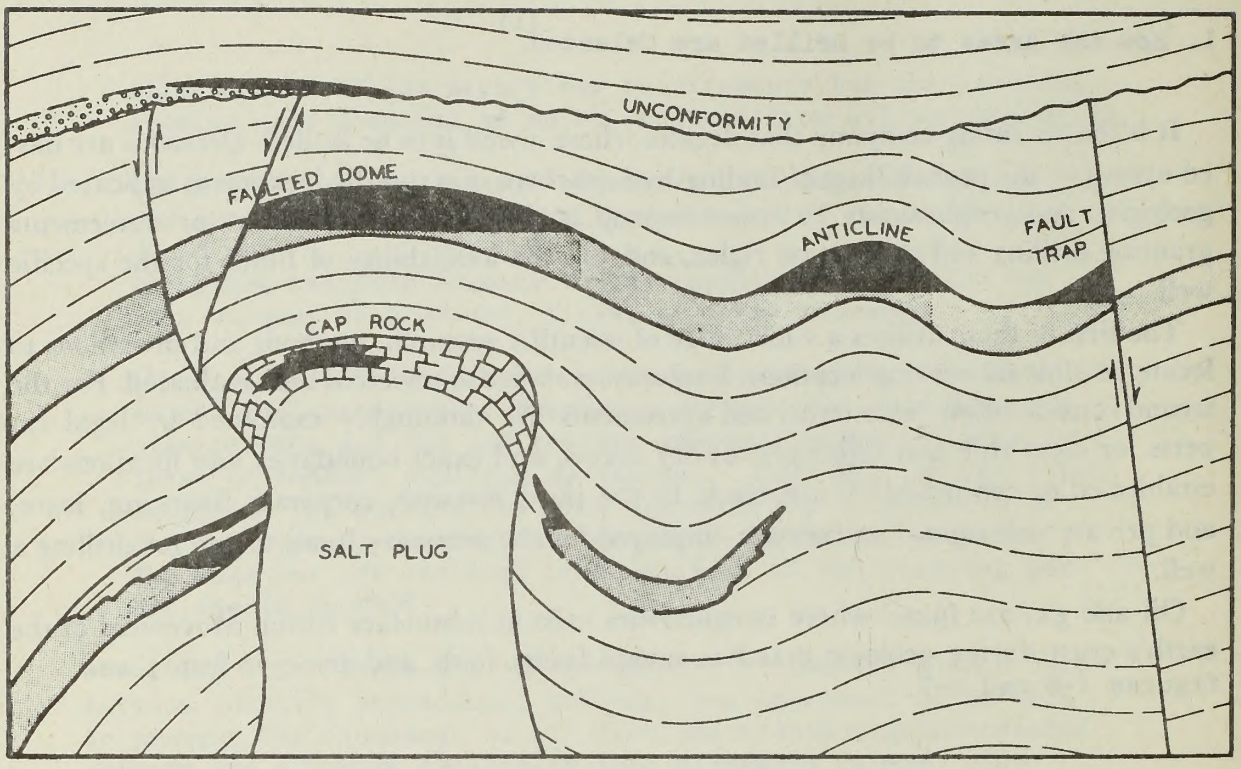


Figure- I-7 Common types of structural traps.

Along fault lines a break in formation layers accompanied by vertical movement of one or both sides of the fault may result in traps which can collect migrating formation fluids. Upfolding of stratified rock can produce anticlines or ridges. Troughs of folded rock are called synclines. Stratigraphic traps capable of being reservoirs sometimes form where lithological changes have decreased the porosity and permeability of certain strata. Porosity of a rock formation indicates the percent of void space that may contain a fluid; permeability is a measure of the degree of ease with which fluid can move through a formation.

Historically, surface geologists have identified faults, anticlines, and domes by outcrops of rocks and layers at the surface and thus have found many oil fields. Domes, particularly salt domes, often give some evidence in terms of elevation above the surrounding land. Aerial surveys reveal evidence of outcrops in remote and inaccessible regions by changes in the vegetation and other indications. Photographs from orbiting satellites have been used for this purpose.

Geophysics and subsurface geology have advanced to a point of considerable reliability in locating and identifying unconformities, i.e. deviations from the conventional pattern of sedimentation and stratiformation. Electric log correlations over long distances have proven the existence of structural traps for oil.

2. Procedures

Petroleum operations progress through four identified stages; exploration, development, operation, and close-out.

Several phases may occur simultaneously in an area. One company may drill an exploratory well on a lease while another company conducts development on adjacent areas. If only one company is interested in the area, normally only one phase of the operation will take place at a time.

Exploratory wells are drilled on a small percentage of the area covered by preliminary investigations.

Exploration begins with an office review of geological and technical data available for the region. In many oil and gas producing regions, an office analysis may develop enough information to proceed with drilling without conducting additional preliminary investigations. The office analysis may indicate only a broad prospective area, and further preliminary investigations may be required.

Preliminary investigations are made from the air and on the ground. Airborne investigations by small aircraft and helicopters are used to conduct visual reconnaissance, photographic, and geophysical surveys.

Surface investigations by geological and geophysical surveys may involve either casual or intensive use of the land. Casual uses generally do not disturb the surface. Intensive uses include operations which require clearing of the new access trails, movement of heavy equipment, or other actions which can result in substantial surface disturbance. Geological, geochemical, and soil-gas surveys normally do not involve a disturbance of the surface. Seismic surveys, one of the most frequently used methods of geophysical investigation, often require the clearing of new access trails and the movement of heavy equipment.

In seismic surveys, a shock wave is sent into the subsurface and the time required for the wave to travel to and return from a subsurface horizon is recorded. A map of the subsurface can be drawn from an analysis of the differences in the time it takes the wave to be reflected back to the surface from the various rock formations.

Explosive, thumper or vibrator methods are used to produce the shock wave.

In the explosive method, shot holes are drilled to a depth of 50 to 200 feet. Four to twelve holes are drilled per mile of line. The holes are loaded with 5 to 50 pounds of explosives and detonated. The same hole may be reloaded and shot several times to find the depth and explosive charge returning the best reflection or refraction signal.

The thumper and vibrator methods pound or vibrate the earth to create a shock wave. Less than 50 square feet of surface area is required to operate the equipment at each test site.

The sensors and energy source are located along straight seismic lines laid out on a 1- to 2- mile grid. Existing road systems are used where available. Lines may be cleared of vegetation and loose rocks to improve access for the trucks. Each mile of line cleared to a width of 8¼ feet utilizes one acre of land.

Exploratory drilling does not begin until a lease has been acquired by the operator. In areas where preliminary investigations are favorable and information warrants further exploration, exploratory drilling may be conducted. More precise data on the geologic structure are obtained by stratigraphic tests utilizing shallow holes. The presence of suspected oil and gas deposits may be confirmed by wildcat drilling of deep holes.

Both the stratigraphic tests and wildcat wells require a permit to drill issued by the appropriate USGS District Engineer. The State of Washington also regulates exploratory drilling and associated activities and facilities.

Stratigraphic test holes are drilled 100 to 500 feet deep to locate geologic indicators. The holes are usually drilled with truck-mounted equipment and disturb a relatively small area. Stratigraphic holes in areas of shallow high pressure zones are cased. The roads and trails constructed for access to the test sites are temporary and involve minimal construction. The drill site occupies approximately 900 square feet and is sometimes placed in the center of a new or existing trail.

Wildcat wells are deeper tests, require larger drilling rigs with support facilities, and may disturb a larger surface area than stratigraphic tests. Required facilities include roads, drill pads, mud pits and - in some cases - camps and airports.

Nationwide, approximately one out of every seven wildcat wells drilled in 1974 was finished as a producer. However, only one in 59 resulted in the discovery of significant recoverable reserves (more than one million barrels of oil or six million cubic feet of gas).

After a drilling site has been selected, a heavy-duty road is built to move the drilling rig and other equipment to the location if existing roads will not suffice. The roads are not designed for permanent access.

The well site occupies about an acre and is cleared of all vegetation and graded nearly flat. Depending on the soil in the area, the well site or drill pad and roads may or may not be graveled. The drilling rig, mud pumps, mud pit, generators, pipe rack, and tool house are located on the drill pad. Other facilities such as storage tanks for water and fuel may be located on or nearby the drill pad. (See Figures I-8 through I-13.)

A water supply is required for mixing drilling mud, cleaning equipment, cooling engines, and other uses. A pipeline may be laid several miles to a pump installed at a stream or to a water well.

Conductor pipe is set to a depth of 15 to 20 feet to keep surface sand and dirt from sloughing into the well. Surface casing is set to a depth of several hundred feet to protect any fresh water zones and to keep the well from blowing out in the event a high pressure zone is encountered. As the well deepens the drilling crew adds new joints of drill pipe to the top of the string.

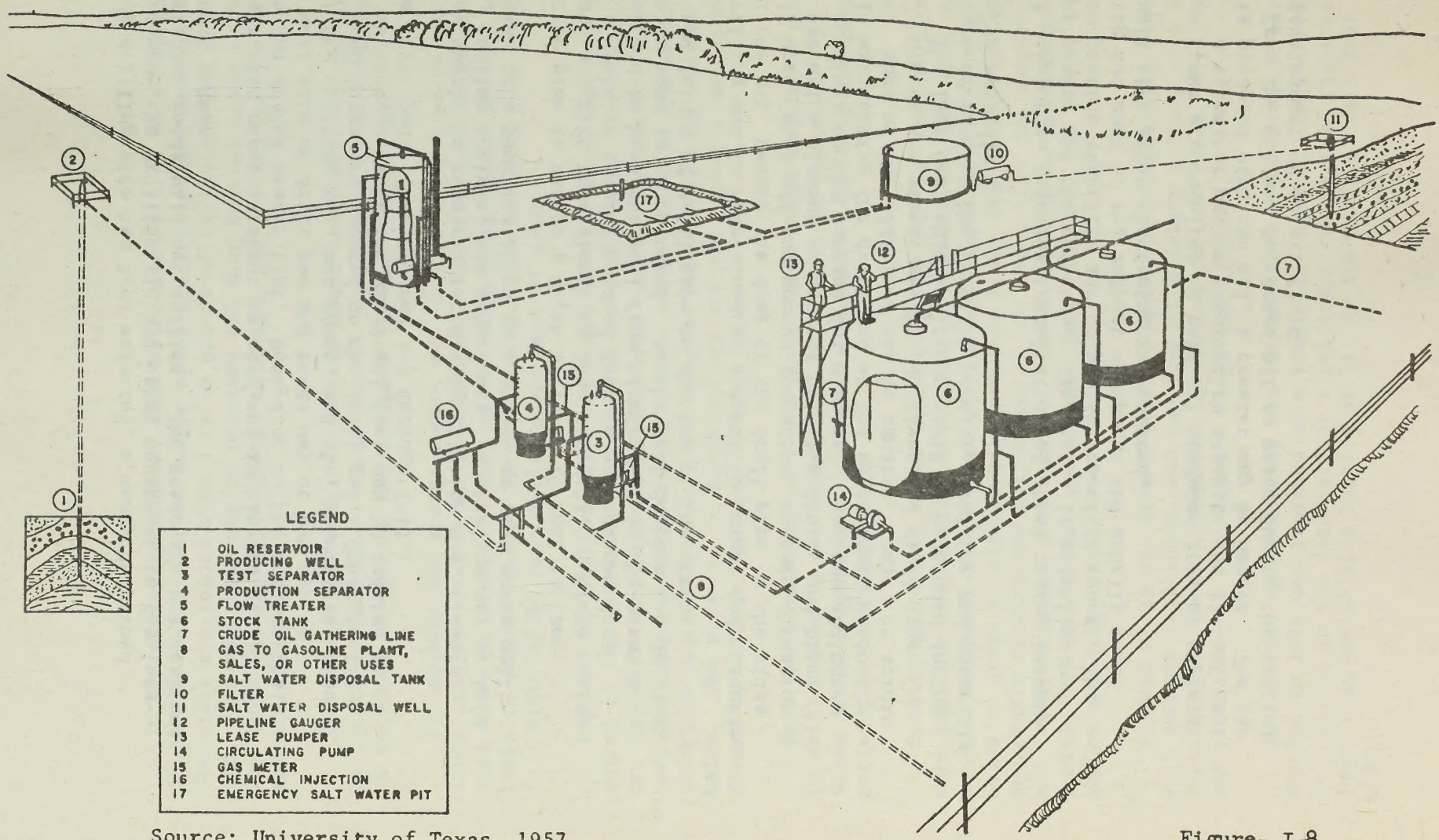
The drilling mud is maintained at a specific weight and viscosity to cool the bit, reduce the drag of the drill pipe on the sides of the well bore, seal off any porous formation, contain formation fluids to prevent a blowout or loss of drilling fluid, and bring the drill cuttings to the surface for disposal. Various additives are used in maintaining the drill mud at the appropriate viscosity and weight. Some of the additives can be caustic, toxic, or acidic in nature. Others are simply weight additives and fluid loss additives. The less desirable additives could be precluded during the procedure of issuing the drilling permit. Drilling mud materials are listed in Appendix F.

A well completion requires installation of steel casing between the surface casing and the pay zone. The casing is selectively cemented to provide stability and to protect specific zones. The drilling rig and most of the support equipment are usually moved from the well site after the casing is cemented.

Storage tanks are required to hold oil produced from an exploratory well. A separator may be required to separate the oil and gas. If water is produced with the oil, a treater may be needed. The gas separated from the oil may be burned off as waste during the initial stage of development of an oil field.

FLOWING OIL PRODUCTION

WELL AND FLOW LINES - SEPARATION AND STORAGE - SALT WATER DISPOSAL



Source; University of Texas, 1957

Figure- I-8

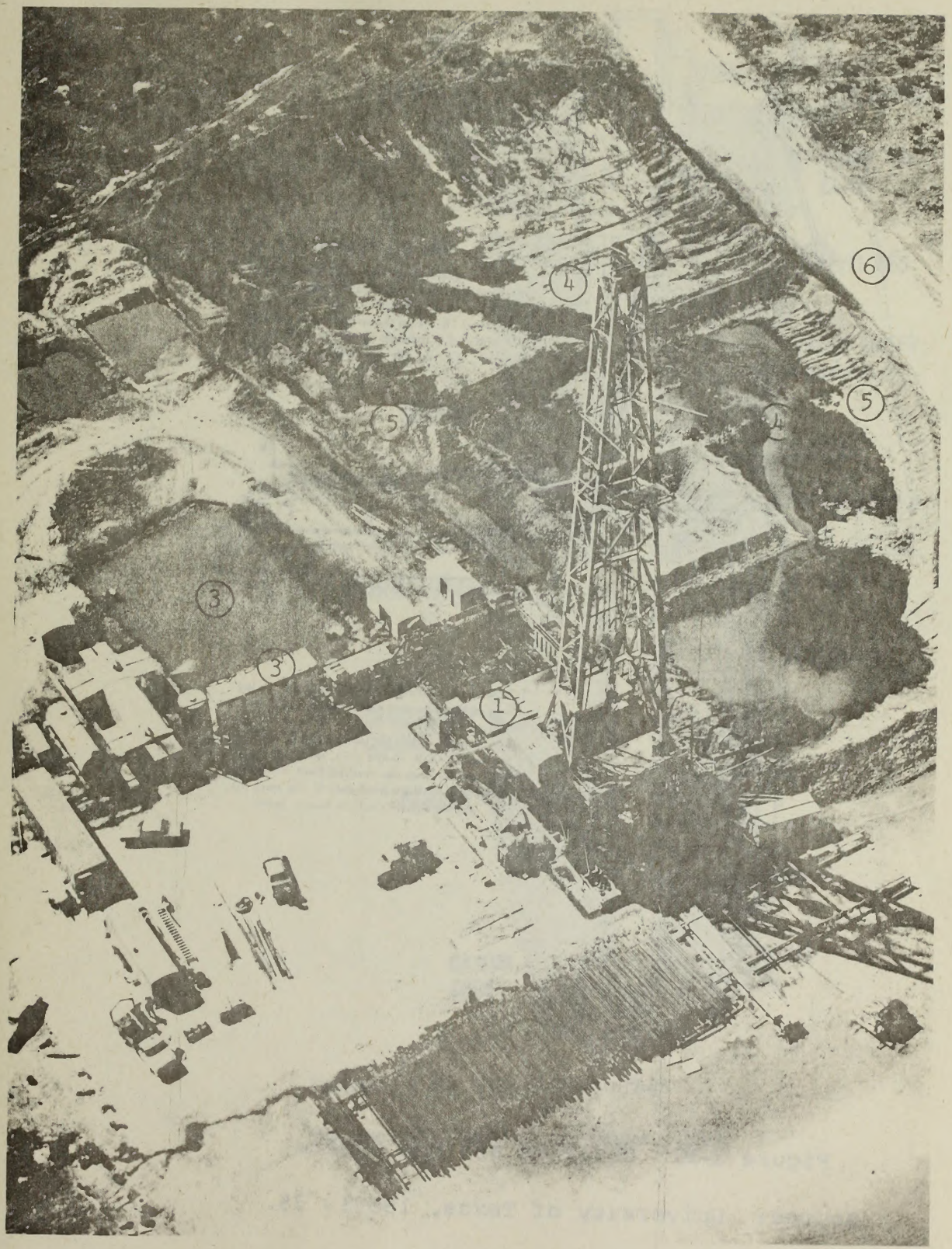


Figure- I-9 A modern deep well drilling operation.

1- Drill rig
2- Pipe rack
3- Drilling mud, pit and pumps
4- Drilling cuttings waste pit
5- Waste pit dikes
6- Access road

Source: University of Texas, 1957

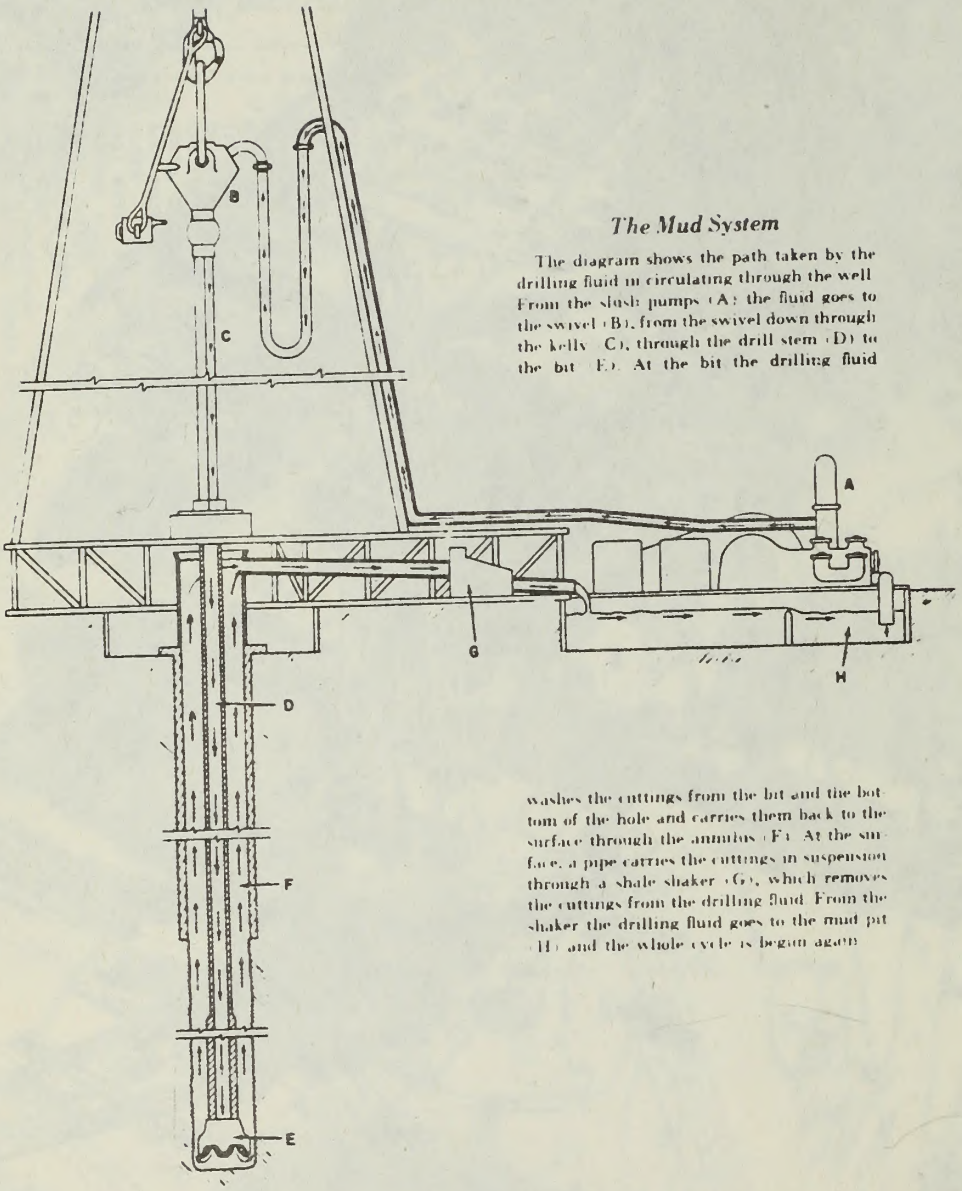

The Mud System
The diagram shows the path taken by the drilling fluid in circulating through the well. From the slush pumps (A) the fluid goes to the swivel (B), from the swivel down through the kelly (C), through the drill stem (D) to the bit (E). At the bit the drilling fluid washes the cuttings from the bit and the bottom of the hole and carries them back to the surface through the annulus (F). At the surface, a pipe carries the cuttings in suspension through a shale shaker (G), which removes the cuttings from the drilling fluid. From the shaker the drilling fluid goes to the mud pit (H) and the whole cycle is begun again.
A
B
C
D
E
F
G
H

Figure I-10 Drilling and Mud System

Source: University of Texas, 1957: 35.

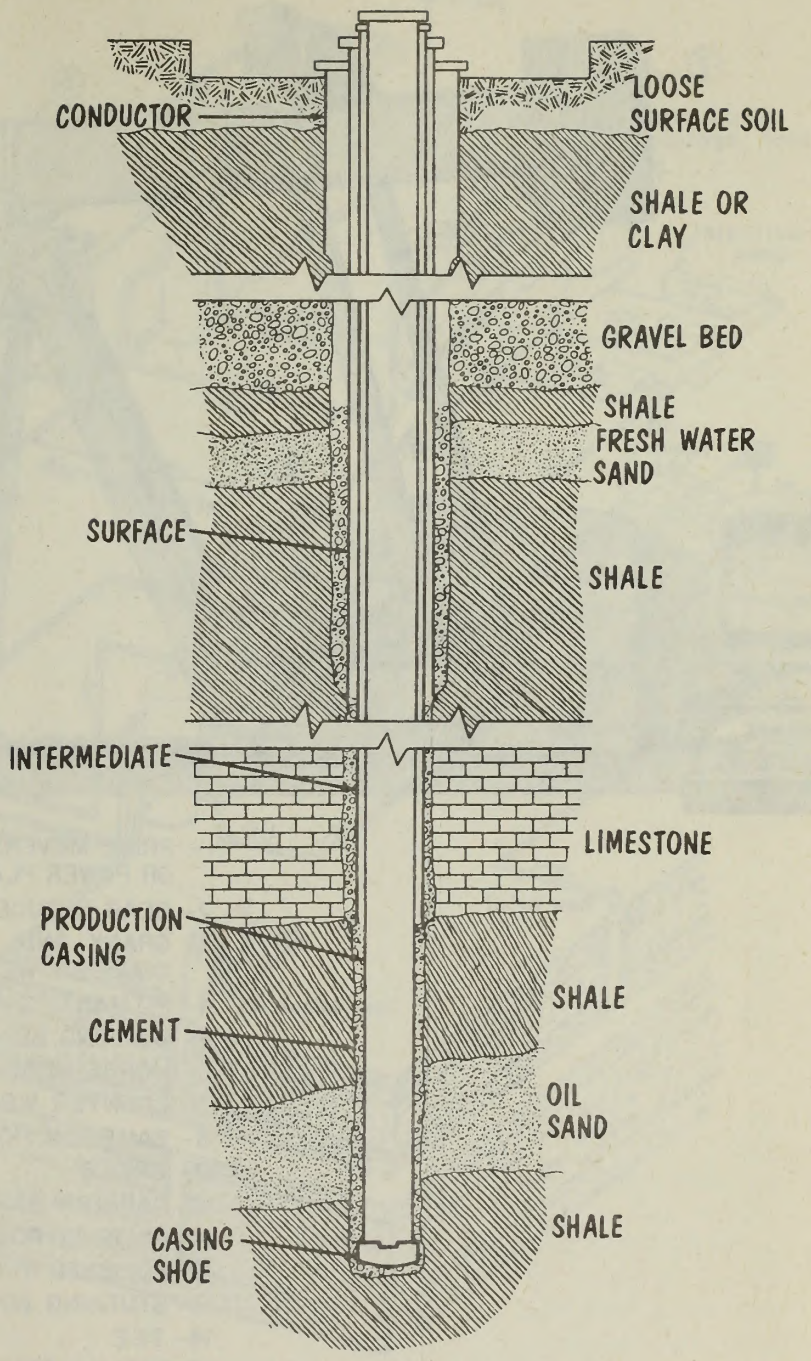


Figure- I-11 Oil Well Casing

Source: University of Texas, 1957

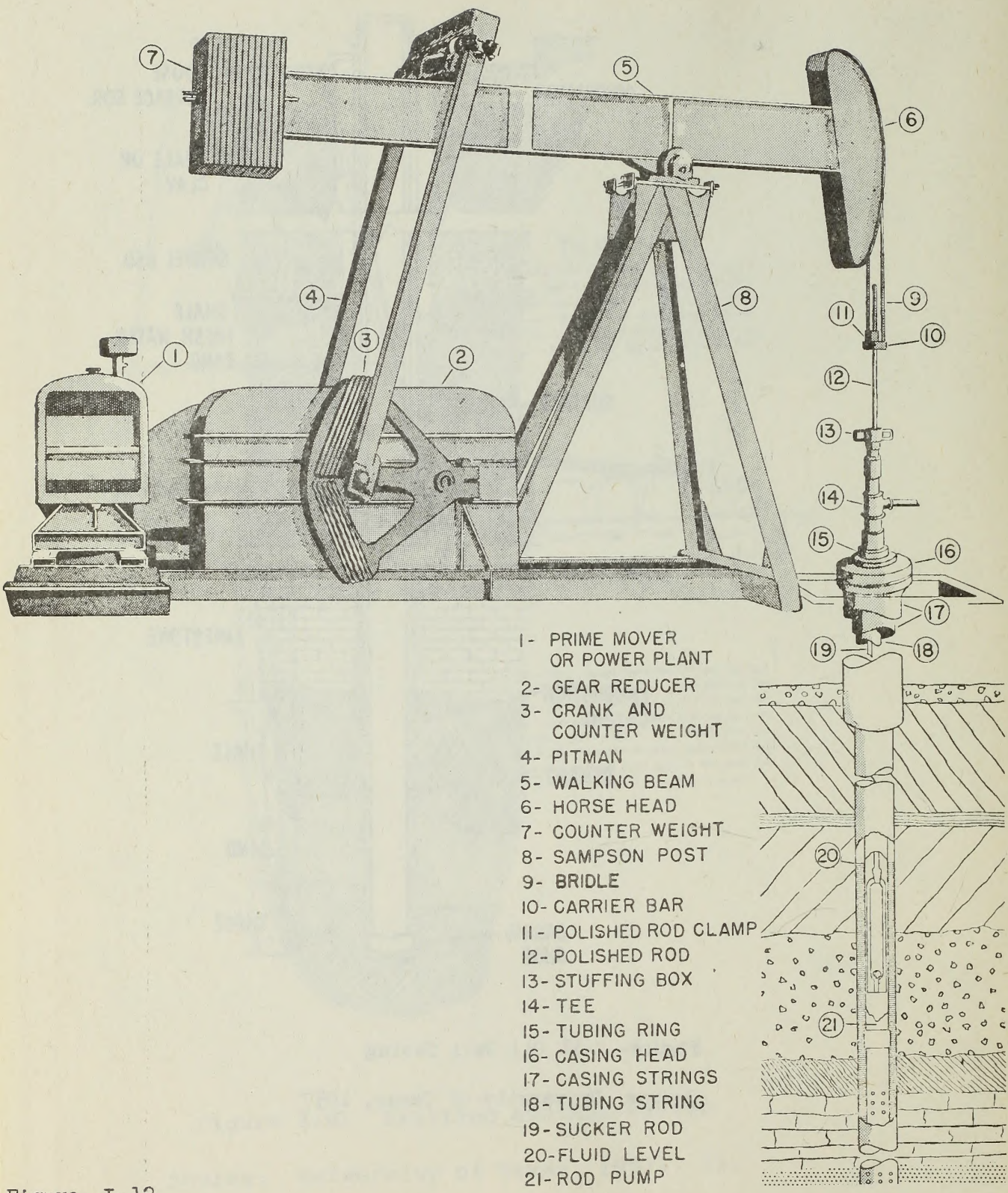


Figure- I-12

BEAM PUMPING UNIT COMPONENTS. The main parts of a conventional pumping unit are shown in this drawing. Most beam pumping units operate generally following these principles.

Source: University of Texas, 1957

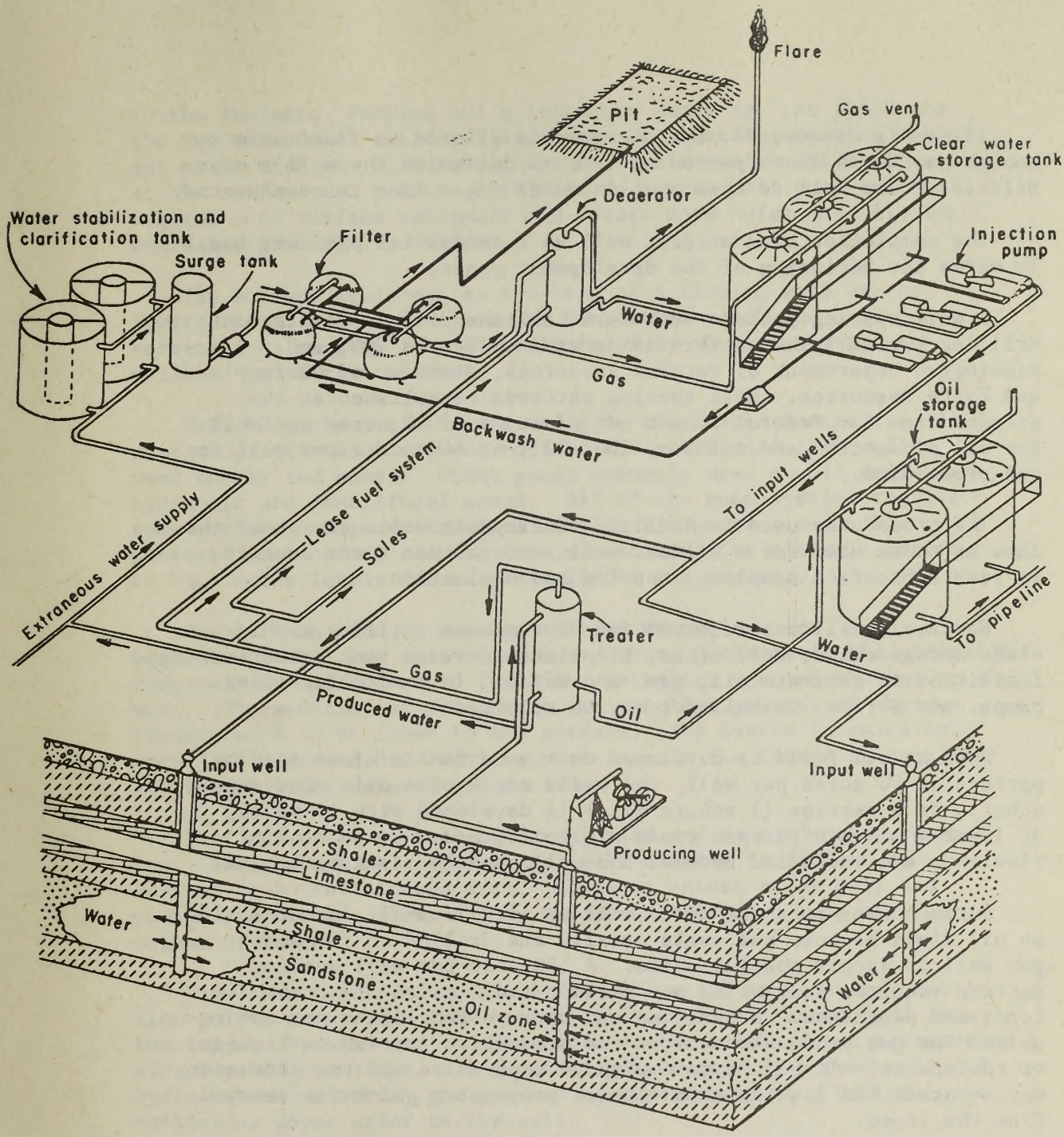


Figure I-13 . Waterflood Secondary Recovery System

Source: BuMines, 1970: 26.

If gas is discovered, the operator is allowed to flare only enough gas for a short period of time to determine the well's capabilities. The well is then shut-in until a gas line is constructed.

The completion of a wildcat well as a commercial producer usually marks the beginning of the development phase.

A well spacing pattern must be established before development drilling begins. The pattern is determined by the USGS and Washington Department of Natural Resources, Division of Geology and Earth Resources. Most spacing patterns established at the present time for Federal leases set minimums of 40 acres per well for oil production and units of 160, 321, or 640 acres per well for gas production.

The procedures used in drilling development wells are about the same as those used for a wildcat well, except that there usually is less subsurface sampling, testing and evaluation.

Surface facilities required for development drilling may include access roads; well sites, flowlines; storage tank batteries; facilities to separate oil, gas, and water. In remote locations, camps, air strips, or helispot may be required.

When an oil field is developed on the current minimum spacing pattern of 40 acres per well, the wells are ¼ of a mile from each other. If a section (1 square mile) is developed with 16 wells, at least 4 miles of access roads are built, and 4 to 6 miles of flowlines are installed between the wells and the tank batteries.

Surface uses in a gas field will be significantly less than in an oil field because gas wells usually are drilled on 160-acre per well or larger spacing units. A 160-acre per well spacing pattern requires four wells per section and 2 miles of access roads and pipelines. Separation and storage facilities are not required for gas production unless the production is rich in liquids, or condensate. It may be sold without separation and the purchaser may separate the liquids at a central processing point far removed from the lease.

Oil and gas field production facilities are illustrated in Figure I-7.

Well facilities in oil fields may vary. Pressures in some petroleum reservoirs are great enough to force oil to the surface. The result is a flowing well. Most oil wells in the United States require the use of some means of artificial lift to bring the oil

to the surface. Pumping and a technique known as "gas lift" are the two methods of artifical lift used at present. Flowing wells and wells with gas lift facilities require a minimum of equipment at the surface and produce little or no sound. All pump systems require more surface equipment and create more noise than flowing wells and gas lift facilities.

The surface equipment at the head of a flowing well may be limited to a series of valves, or "Christmas tree" and a fenced service area ranging from 15-by-15 to 50-by-50 feet around the wellhead and Christmas tree.

Over 90 percent of the oil wells in the United States in 1971 were on artificial lift, and most of the artificial lift wells used sucker rod pumps. Other pumps commonly used on oil wells are hydraulic and centrifugal pumps. All of the pump systems require some surface equipment and fuel or electric power lines. All generate some noise, ranging from almost none for electric motors to high noise levels for single cylinder gas engines.

Gas lift is used in some oil fields where low cost, high pressure natural gas is available and where pressure in the petroleum reservoir is sufficient to force the petroleum part of the way up the well. The addition of gas lowers the specific gravity of the petroleum so that it flows to the surface. The system is quiet and uses little ground. It will be used less in the future as supplies of high pressure natural gas decline.

Most gas wells produce by normal flow and do not require pumping. Surface use at a flowing gas well usually is limited to a 20-foot by 20-foot fenced area. If water enters a gas well and chokes off the gas flow, a pump may be installed to pump off the column of water.

Flowlines transfer crude oil from the wells to a central collection point, or storage tank battery, before it is transported from the lease. Natural gas is often sold at the wellhead and transported directly off the lease. If processing is required to remove liquid hydrocarbons or water, the gas may be transferred to a central collection point prior to the sale.

Oil and gas are transferred from the wells to central collection points in flowlines. The flowlines usually are 3- or 4- inch diameter steel pipes. They may be buried, installed on the surface, or elevated.

There are various separating, treating and storage facilities involved in oil and gas production. If the fluids produced at the well contain gas and water, the oil, gas and water are separated before the oil is stored in the tank battery. The batteries usually contain at least two tanks and usually are located on or near the lease.

Small leases may contain only one tank battery; large leases may contain several, with each battery containing separating, treating and storage facilities.

Although most water produced with oil and gas is brackish to highly saline, some produced water is fresh enough for beneficial surface use. Saline water is disposed of in evaporation pits or by subsurface injection. Evaporation pits are used mainly in arid regions where evaporation rates are high. In areas such as the Columbia Basin where rainfall does not exceed the evaporation rate, disposal by evaporation would be feasible.

When salt water is disposed of underground, it is introduced into a subsurface horizon containing water of equal or poorer quality.

Increased recovery of petroleum is accomplished by several methods. Oil cannot be produced unless forces within the petroleum reservoir are great enough to drive the oil to the well bore. Primary production occurs when energy in the reservoir is sufficient to drive the oil to the well. When natural energy sources are inadequate, secondary production methods involving gas or liquid injection may be used to supplement the natural forces.

In water flooding, the most commonly employed form of secondary recovery, water is injected into the reservoir to drive additional oil to the producing wells. On the average, a successful waterflood will increase recovery by roughly 100 percent.

Other secondary techniques for improving oil recovery have been tested, including miscible flooding (injecting chemical compounds with water) fire flooding (starting a controlled fire in the reservoir) and steam flooding (injecting steam into the reservoir). Some of the techniques have been used for tertiary recovery after a water flood.

Natural gas also is injected into some oil reservoirs during primary recovery as a pressure maintenance program.

In some gas condensate reservoirs, some of the components of the gas condense into liquid form near the well bores when production

reduces pressures in the reservoir. The resulting reduction in permeability may cause a significant loss in recovery. To prevent this, gas is injected to maintain pressure above the lower condensation pressure.

Land requirements for oil field facilities on leases use well spacing patterns range from 20 to 640 acres per well. The land uses for all facilities in a developed field may range from 22.4 acres per square mile with a 20-acre per well spacing pattern, to 2.4 acres per square mile with a 640-acre per well spacing pattern.

Less land is usually used in gas fields than in oil fields because gas production often does not require storage on the lease.

The number of people employed in an oil or gas field varies with the characteristics of the production and the number of leaseholds in the field. If the wells flow without pumping, one employee in a large, modern field can control production of about 25 wells. When wells are pumped, one employee in a large modern field can control production on 10 to 20 wells. If oil storage tanks are manually gauged and sampled, one employee can service approximately 25 tanks. If automatic gauging and sampling devices have been installed, one person can service the equivalent of 100-150 tanks. In a large, modern field, one five-man maintenance crew can service up to 50 wells.

Abandonment of dry wildcat and development wells consists of plugging before the drilling rig is removed. This allows the operator to use the drilling rig to plug the hole and avoid bringing in other equipment. After the drilling rig is removed, the surface, including the reserve mud pit, is restored to its original condition insofar as possible.

Abandonment of production and injection wells and related facilities is allowed only after lessee demonstrates the well's unsuitability for further profitable production to the USGS district engineer. In some cases, wells are plugged as soon as they are depleted. In other cases, depleted wells are not plugged immediately, but are allowed to stand idle for possible later use in a secondary recovery program. It should be noted that an injection well which disposes of any waste water derived from non-Federal, i.e., fee or private leaseholds cannot be allowed on a Federal oil and gas lease without a Special Land Use Permit (SLUP) from the BLM. The BLM must prepare an EAR in such circumstances.

When an entire lease is abandoned, the separators, treaters, tanks, and other processing and handling equipment are removed and the surface restored. Flowlines and injection lines installed on the surface

are removed, but buried lines usually are left in place. The operator's bond with the Federal Government is not terminated until BLM has approved surface restorations, the USGS has approved subsequent reports of abandonment, and royalties due the Federal Government have been received.

II. Description of the Existing Environment

The existing environment will be considered as one basic area when conditions are the same or very similar in nature. However, where there is a need to identify areas separately because of local differences, we will consider the following five basic areas.

1. Saddle Mountain
2. Yakima Canyon
3. Rattlesnake Hills
4. Wenatchee National Forest
5. Other or scattered tracts

A. Non-Living Components

1. Air

The air movement patterns of the southwest basin area and the Cascade foothills around Yakima are very similar.

Wind direction prevails out of the NW to WNW year around. The average annual wind speed is 7 to 8 mph with a highest monthly average of 11 mph in April 1959. The lowest monthly average was recorded at 3 mph during November 1956.

Tremendous wind currents occur locally in Sentinel Gap, where the NW prevailing winds are funneled through this narrow Columbia River Canyon. Barchan Sanddunes just SE of Sentinel Gap illustrate the predominently NW prevailing winds.

The Wenatchee National Forest has similar wind patterns, the prevailing winds are westerly. There is a period in the late summer when easterly winds can be anticipated. The areas are mountainous and timbered so wind velocities near the ground are usually low, ridgetops being the exception.

Temperatures are listed by areas as follows:

(a) Saddle Mountain

The average summer temperature is 74°F and the average winter temperature is 32°F. Record high temperature of 115°F occurred during July of 1939 while the record low of -27°F was recorded in December 1919. Frost free days vary from 170 to 210 in the area starting in mid April. See Map II-1.

(b) Yakima Canyon

Temperature data was obtained by averaging measurements from the Ellensburg and Yakima weather stations. Yearly average is 49°F with a summer average of 68°F and a winter average of 32°F. Temperature drops slightly to the north from Yakima to Ellensburg. Record high was 110°F in Yakima, August 1971 while the record low was -25°F in February 1950 also in Yakima.

The growing season would be about 140 days at Yakima. This is due to the slightly lower temperature north of Yakima. See Map II-1 for frost free days.

(c) Rattlesnake Hills

The average annual temperature for the Rattlesnake Hills area is 54°F. This was calculated from four local climatological stations (Priest Rapids, Sunnyside, Wapato and Yakima). Average summer temperature is 72.0°F and an average winter temperature is 36°F in the area. Record high of 110°F was recorded in August 1971 while the record low was -25°F in February 1950 (Yakima Station). See Map II-1 for frost free days.

(d) Wenatchee National Forest

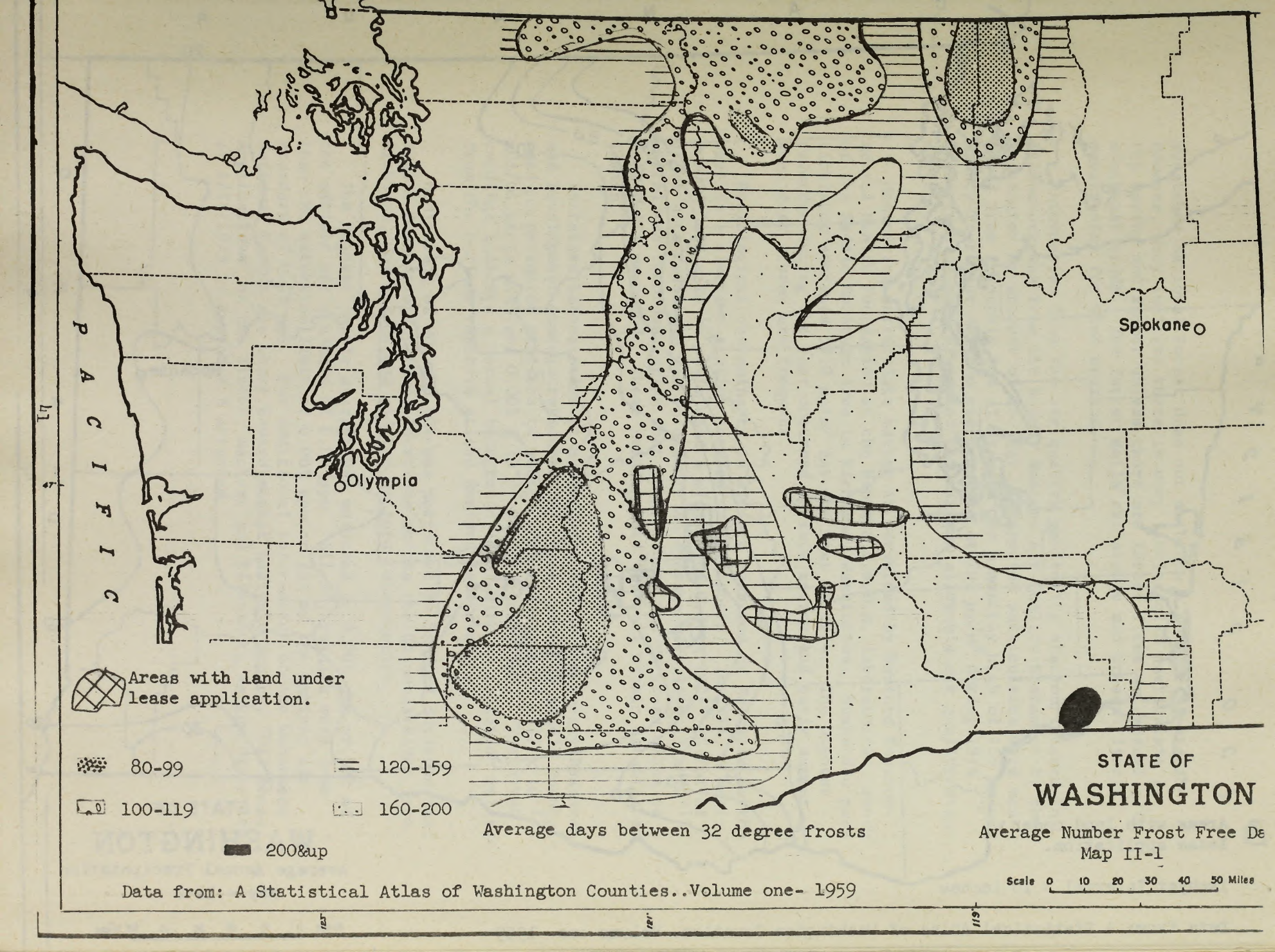
The frost-free period can vary from 30 to 90 days with an average of 60 days. See Map II-1. The summer minimum temperature ranges from 40° to 60° while the summer maximum temperatures range from 60° to 80° with an occasional extreme maximum of 100°. Winter temperatures ran from 0° to plus 20° with extremes of -25° or +40°.

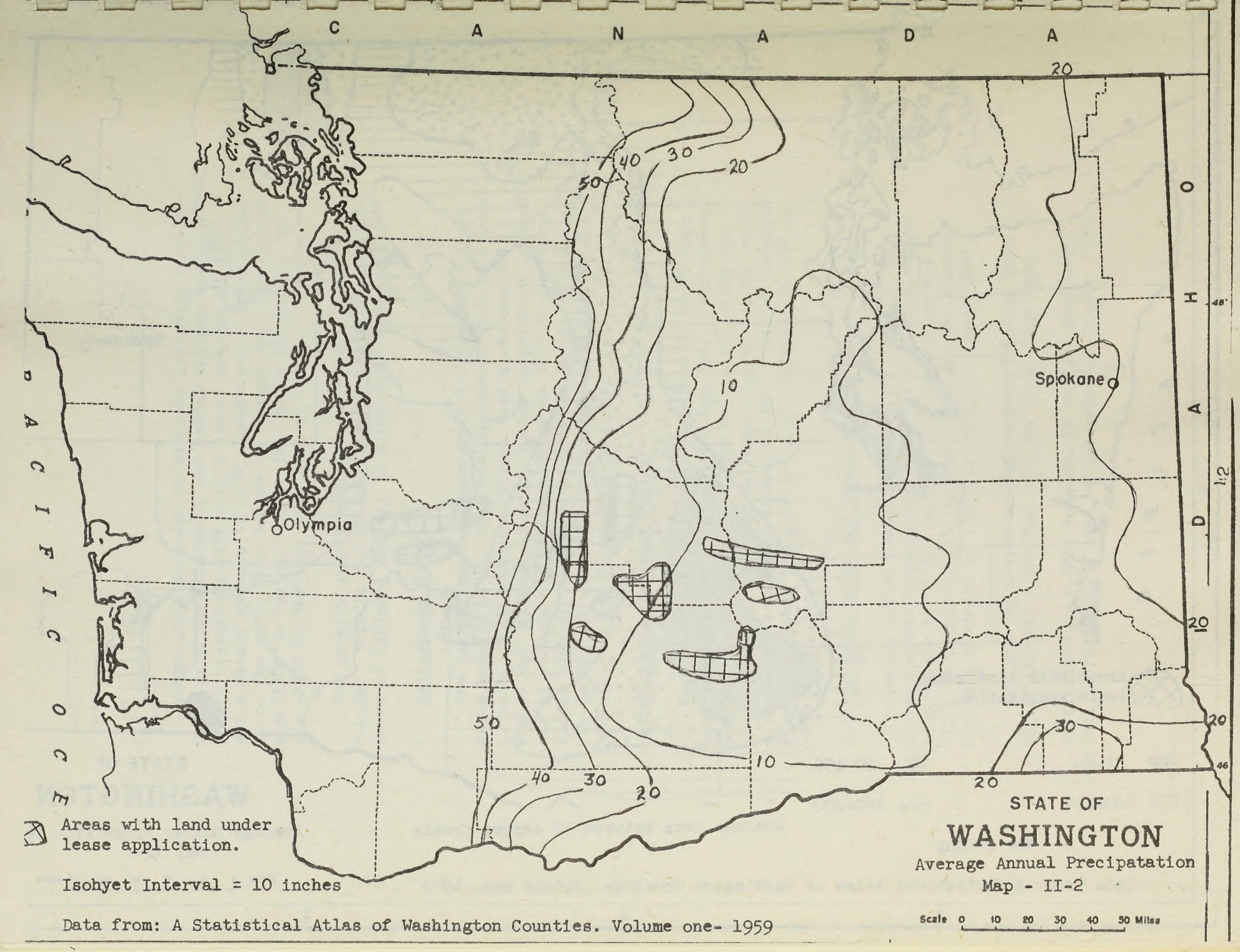
(e) Frenchman Hills and others

Average annual temperature for the area is 49°F. Average winter temperature is 32°F and average summer temperature is 66°F. Extreme low temperature was -31°F in Ellensburg in December 1919 and the extreme high was recorded at 114°F in Othello, August 1961.

The growing season averages about 160 days from May to October. See Map II-1 for frost free days.

Particulate matter is measured by two air monitoring stations in the general area of the proposed leases. The


PACIFIC
Olympia
Spokane
Areas with land under lease application.
80-99
100-119
120-159
160-200
200&up
Average days between 32 degree frosts
STATE OF
WASHINGTON
Average Number Frost Free Da
Map II-1
Scale 0 10 20 30 40 50 Miles
Data from: A Statistical Atlas of Washington Counties..Volume one- 1959


C A N A D A
PACIFIC OCEAN
IDAHO
Olympia
Spokane
20
30
40
50
10
Areas with land under lease application.
Isohyet Interval = 10 inches
Data from: A Statistical Atlas of Washington Counties. Volume one- 1959
STATE OF
WASHINGTON
Average Annual Precipatation
Map - II-2
Scale 0 10 20 30 40 50 Miles

Wenatchee National Forest does not maintain a monitoring station. However, they indicate there is very little solid particulate in the spring and summer unless there are forest fires or unusual southeast winds. The forest soils are stable and present little opportunity for wind erosion.

Information from the air quality monitoring station located in Ellensburg was from the annual Ambient Air Quality Statement by the Washington Department of Ecology. Suspected particulates were measured from a monthly low of 39 $\mu g/m^3$ to a monthly high of 156 $\mu g/m^3$. Twenty-four hour maximum was measured at 202 $\mu g/m^3$ during 1974. These reading meet or exceed the maximum allowable air quality standards.

Monitoring particulate matter is performed by Hanford Environmental Health Foundation at the Hanford E.R.D.A. laboratories, south of the Saddle Mountain Area in Richland, Washington. Suspended particulates averaged 57.0 $\mu g/m^3$ for the year of 1974. The highest recorded during the year occurred in late spring and early summer when dust storms are frequent.

Radiological contaminants in air are measured by Battelle Northwest in a district station located in Ellensburg. In 1974, a maximum of 0.28×10^{-12} $\mu Ci/ml$ and a minimum of 0.04×10^{-12} $\mu Ci/ml$ of gross beta radiation was recorded. An average of $0.15 \pm 0.13 \times 10^{-12}$ $\mu Ci/ml$ was recorded during that year. There was no gross alpha or Iodine-131 measured. These readings are all well within established limits.

Battelles Laboratories at Hanford located on the Energy Research and Development Administration (ERDA) sites, south of Saddle Mountain used its perimeter stations to record a 1974 average of 0.17×10^{-12} $\mu Ci/ml$ gross aeta and 0.002×10^{-12} $\mu Ci/ml$ gross alpha. These recordings indicate a normal background level with no radiation release from the nuclear reactors at the Hanford Laboratories.

Monitoring of NO_2 and SO_2 was performed by Hanford Environmental Health Foundation at three locations across the Columbia River from Richland, North Richland and the Hanford Laboratories.

The highest yearly average was measured at 0.006 ppm or 12% of the ambient air standard of 0.05 ppm. All SO_2 results were less than the detection limit of 0.005 ppm or 25% of the ambient air standard of 0.02 ppm. For additional information on the Wenatchee National Forest see their Environmental Analysis Report, "Oil Lease Applications" on the Tieton, Naches, and Ellensburg Ranger Districts of 1/16/1975 in Appendix B attached.

2. Land

Lands in or near the basic area tend to have similar characteristics. The Saddle Mountains, Yakima Canyon, Rattlesnake Hills and other scattered tracts including the Frenchman Hills area are grouped together.

Land use suitability is summarized as follows:

a. River bottom or river wash; no agricultural value, some grazing values as browse for cattle and game animals. Provide cover for large and small animals and birds. Often provides scenic and recreational values.

b. Steep, broken, rocky lands; unsuited for agriculture, provides limited browse and grazing for cattle and game animals. Small mammals, reptiles and birds find food and cover in these areas. Scenic values are often high, recreational usage will vary according to access and terrain.

c. Stony, shallow soils (scablands); usually unsuited for agriculture other than limited hay cropping. Makes good range land for cattle and some large game animals. Small mammals, reptiles and birds find food and cover in these areas.

Recreational values may be important for hunting of upland game birds. Areas may have foreground or middle ground scenic values.

d. Loamy or sandy loam soils; usually rich soils suitable for dryland farming such as raising wheat or barley. These soils put under irrigation will produce crops such as potatoes, sugarbeets, wheat, hay, fruit trees and grapes.

The Wenatchee National Forest is a high mountain geographic area. Grazing is limited to natural feed areas, meadows and transitory range activities and occurs throughout the area, except for heavy timber stands which limit the forage availability. Recreation use occurs throughout the area and is classed as moderate during the summer months, primarily with ORV vehicle use, and in the fall with big game hunting.

Due to the nature of the land, slope, elevation, precipitation, soil and accessibility, the highest and best use of the area is in growing trees and providing for outdoor recreation. The timber lands lend themselves well to a variety of silvicultural treatments ranging from tree

selection to shelterwood cuttings. Most of the timber harvested in the area has been primarily through selective tree cutting. Care must be exercised on some thin soils and south slopes to prevent unnecessary soil erosion.

Generally speaking, most of these timber tracts having adequate moisture and soil will produce a stand of timber of average stocking.

Primary present uses of this land are: 1. Growing timber, 2. Grazing, 3. Wildlife, 4. Recreation, 5. Water.

The soils of the Columbia Basin tend to be a loess or a loess mixed with basaltic residium-colluvium in higher basin unglaciated areas or sandy gravelly outwash, loess, mixed with residium-colluvium, and some alluvium on bottomlands in areas that were glaciated.

In the irrigated farmland areas these are usually Weirman-Zillah, Naches-Woldale or Warden-Shano soils.

The well drained, gently sloping to steep, deep soils formed in loess are of the Renslow-Ritzville Association. The gently sloping, well drained, shallow, stony soils formed in loess, mixed with weathered basalt are generally of the Rock Creek-Starbuck Association.

The forest areas are generally of the Rough Mountainous Association, dominantly cryandepts. These are steep to very steep, well drained, stony and sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains.

Most of the soils in the Wenatchee National Forest have received volcanic ash influence in recent geologic history, as indicated by a thin layer of surface ash or ash incorporated with the surface soil layers. Unincorporated ash layers range in thickness from 0 to 6 inches. The ash ranges in texture from sand to sandy loam and ranges in color from gray to dark yellowish brown.

These forest soils characteristically exhibit little orthological development, are generally shallow to moderately deep (2 to 5 feet), weakly structured, well drained, gravelly, medium to moderately coarse textured and are derived from a wide variety of hard and moderately hard rock types, including volcanics, sedimentary and granitics.

The Soil Association Map, II-3, outlines general soil associations common throughout the lease application area.

Detailed information on specific soil types in Benton, Grant, Kittitas and Yakima Counties are available in the Spokane District Office of the BLM in Rm. 551, U.S. Courthouse Building. Detailed soils information is given in the following soil survey reports:

Soil Survey--Benton County, Washington, July 1971, by USDA, Soil Conservation Service in Cooperation with the Washington State Agricultural Experiment Station.

Soil Survey--Yakima County, Washington, Series 1942, No. 15 issued April 1958, USDA - Soil Conservation Service in cooperation with the Washington State Agricultural Experiment Station.

Soil Survey--Kittitas County, Washington, January 1945, by USDA, Bureau of Plant Industry Soils and Agricultural Engineering in cooperation with the Washington State Agricultural Experiment Station.

There are new soil surveys presently being conducted for Grant County. The information will be published in the near future. Soils on specific sites can be discussed with the Soil Conservation Service, Room 360, U.S. Courthouse, Spokane, Washington.

Information on Grant County and a portion of the Columbia Basin area are in the following publications:

Soil and Moisture Conservation Survey, Columbia Basin Project, 1962 by the U.S.D.I., Bureau of Reclamation.

Soil Survey (Reconnaissance) Columbia Basin Area, Washington, 1929 by U.S.D.A., Bureau of Chemistry and Soils in cooperation with the Washington Agricultural Experiment Station.

SOIL ASSOCIATION TYPES*

I - Rough Mountainous Association: Dominatly Cryandepts. Steep to very steep, well-drained, stony soils and sandy soils formed in materials mixed with volcanic ash or pumice on terraces, foothills, plateaus and mountains.

II - Rock Creek-Starbuck Association: The area is dominated by gently sloping, well-drained, shallow, stony soils formed in loess mixed with weathered basalt over basalt bedrock.

III - Pensiow-Kittitas Association: Dominated by gently sloping to very steep, well-drained, deep soils formed in loess

IV - Weirman-Zillah, Naches-Woldale, Warden-Shano } These are domirated by level to steep soils which are generally irrigated farmlands.

*Adapted from 1. "Yakima Kittitas Resource Conservation and Development Project Wa."
2. Soil Survey, Kittitas County, Wa. S.C.S. Serles 1937 No. 13.
3. Soil Survey, The Columbia Basin Area, Wa. Dept. Agri., 1929.
4. Columbia-North Pacific Comprehensive Framework Study, 1970.

Wenatchee Nat. Forest Unit

Yakima Canyon

Frenchman Hills

Saddle Mts.

Rattlesnake Hills

LOS ANGELES
OMAHA
GALVESTON
Anchorage
Grand Coulee

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

LANDS UNDER LEASE APPLICATION AS OF Feb. 28 1976

SECTION/FED. TOWNSHIP

OIL & GAS LEASE APPLICATION MAP II-3
Soil Association

BUREAU OF LAND MANAGEMENT
SPOKANE DISTRICT OFFICE
SPOKANE, WA. 99201

The geologic structures of the lease application areas tend to follow regional anticlines, upward folding of the earth's surface, and synclines, downward thrust or folding of the earth's surface. Traditionally oil and gas have been found along flanks or crests of these structures. See Map I-1 for location of lease application areas and their relation to the anticlines of the area. These structures probably had their origin during the Cascade Mountain building episodes.

The history of oil and gas exploration in the State of Washington was discussed in Section I (F).

A brief description of the geologic structure of the five different physiographic areas of the lease applications follows:

Saddle Mountain is the direct result of an asymetrical anticlinal ridge branching off of the Cascade Range. The northern flank angles more steeply than the southern flank which can be seen quite easily from State Highway 243 in Sentinel Gap. To the east, near Othello, the structure becomes less apparent as it plunges into the overlying gravels, silts and sands.

There are no regional faults in the area, however several small faults trending north and south dissect Saddle Mountain. From aerial photo interpretation only a few of the small faults can be seen and there is an indication of a large east-west fault along the north face of Saddle Mountain.

Two major anticlines trend from the northwest to the southeast through the Yakima Canyon area. These are defined as the Manastash Ridge and the Umtanum Ridge. Severe deformation has formed very tight folds in the ridges. An excellent example can be seen approximately 1½ miles south of Wymer on U.S. Highway 97. From these tight folds, flowing springs are located throughout the area.

As with the previous structures, Manastash and Umtanum Ridges were the direct result of the Cascade Mountain building episodes. These two structural elements branch off of the Cascade Mountains and formed approximately 7 to 10 million years ago.

Minor faulting is seen throughout the Yakima Canyon area. Considering the severity of folding in the area, there is actually a lack of major and regional faults. Many of these normal faults can be seen in road cuts on Interstate 82 east of Yakima Canyon.

Several anticlines form the Rattlesnake Hills, Yakima Range and Umtanum Ridge. These anticlines are structural elements branching off of the Cascade Range. Practically all of the oil and gas lease applications are located on or near the crests of these anticlinal structures.

Several thousand feet of Columbia River Group Basalts were folded by the Cascade Mountain building activity of 7 to 10 million years ago. This folding of the crust has formed the anticlines we see today.

There appears to be no major faulting in the area. Several small faults can be seen in the area usually with displacement of less than 10 feet.

The Frenchman Hills is a regional anticlinal structure which trends west to east from the Cascade Range. This anticline, as with the other anticlines in the area, had its origin during the Cascade Mountain building episodes. Out of all of the anticlines in the area the Frenchman Hills anticline is the smallest in height. However, it is an important structure east of the Columbia River as it lies north of the other anticlines and acts as a ground water dam for accumulated water drained from the Grand Coulee area. This is exemplified by the numerous springs and potholes just north of Frenchman Hills and west of Potholes Reservoir.

There appears to be no major offsets due to faulting in the area. Probably many small faults exist throughout the Frenchman Hills, but are not seen due to a regional covering of alluvial materials.

The lease applications in the Wenatchee National Forest overlay the Cleman Mountain anticline, Rattlesnake syncline and the west end of the Umtanum anticline. These northwest to southeast trending structures are all similar to others which branch off the Cascade Range. The overlying basalts of Cleman Mountain anticline have a core of sandstones and siltstone to the west of the lease area. The sandstone and siltstones are derived from volcanic activity and have little indications of hydrocarbons.

A minor anticlinal structure is indicated to the south of the Cleman Mountain feature. It is a small southeasterly plunging feature covered by an andesite flow over basalt.

There is some minor faulting in the area which is generally associated with intrusive volcanics. These intrusions are in the form of dikes associated with an old volcano to the southwest of Cleman Mountain.

3. Water

The arid to semi-arid lands in the study area average from 7 to 15 inches of precipitation. The study area is broken into five smaller physiographic areas which have somewhat similar water quality features. In Saddle Mountain, Frenchman Hills and Rattlesnake Hills some lease applications are on the banks of the Columbia River and data for this large body of water is at the end of this section. The Rattlesnake Hills and Yakima Canyon areas have lease applications which lie in or on the main Yakima River drainage; data on this stream follows that of the Columbia. There are numerous small intermittent streams on the entire study area but there is no information on water quality for them. The few smaller annual streams where there is water quality data will be discussed within the physiographic unit they fall in.

The Columbia River is rated as Class A or excellent by the Washington Pollution Control Commission. This means the water meets or exceeds the requirements for all, or substantially all, uses. These standards are as set by the Washington Administrative Code, Chapter 372-12 for Interstate and Chapter 372-64 for Intrastate water quality standards Supplement #5 (5/1/70). Average annual flow of the Columbia River is 120,000 cfs, the effect of any incoming tributary above the Snake River is not generally measurable. The largest stream, the Spokane River, only contributes 10% of this average flow. Examples of measured units for the Columbia are:

Columbia River & Priest Rapids		Class A
coliform	avg. 30/100 ml	240/100 ml
dissolved oxygen	11 mg/1	greater than 8.0 mg/1
avg. temp.	10.7° C	less than 18.3° C
pH	8-8.5	6.5 - 8.5
turbidity	less than 5 JTU	less than 5 JTU
dissolved solids	73-120 mg/1	----------
hardness	65-85 mg/1	----------

The Yakima River is rated as a Class A stream from Wilson Creek down to the Sunnyside Dam. Below Sunnyside the river is rated at Class B. Irrigation return flows comprise approximately 5% of the Yakima River in the Class A part

and 30% in the river below Sunnyside Dam in the area considered as Class B. In this Class B reach about 65% of the nitrogen is considered to be from irrigation return flows and 20% from municipal wastes.

	Yakima Roza	Yakima Kiona	Class A	Class B
coliform/100ml	120-4000/100ml	6000-170,000	240/100ml	<1000/100ml
dissolved oxygen	11.3 mg/1	10.5 mg/1	>8.0 mg/1	>6.5 mg/1
avg. temp. ^{o}C	9 (0-20.0)	12 (1.0-25.5)	<18.3	<21.1
pH (avg.)	7.7	7.8	6.5-8.5	6.5-8.5
turbidity	<5	<7	<5 JTU	<10 JTU+
dissolved solids	91 mg/1 (62-127)	183mg/1(130-227)	--------	-------
hardness	56 mg/1 (37-76)	109mg/1(75-133)	--------	-------
nitrate	.3-4.4 mg/1	2.1-4.9 mg/1	--------	-------

See ground water Map II-4, maps of local ground water conditions as stated in the Columbia-North Pacific comprehensive framework study.

Ground water data is scarce and only known and potential problems within the study area will be discussed.

Precipitation in the Saddle Mountain averages 6.8 inches and falls mainly in the winter months. Most of the moisture evaporates into the atmosphere as a result of winds and temperature. Small amounts may run off into Crab Creek. However, it is basically evaporated or incorporated into the ground water system. (See Average Annual Precipitation Map II-2)

Drainage of the area is via Crab Creek on the north and east, Columbia River on the west and into the flat lying gravels on the south.

Groundwater is limited by the low recharge rate. It is generally accumulated in the permiable gravels above the dense basalts and between basalt flows. Most of the lease applications are near the summit of the ridge where a water table other than the regional water table is not known to exist.

Water quality of the Columbia River is summarized on page 51.

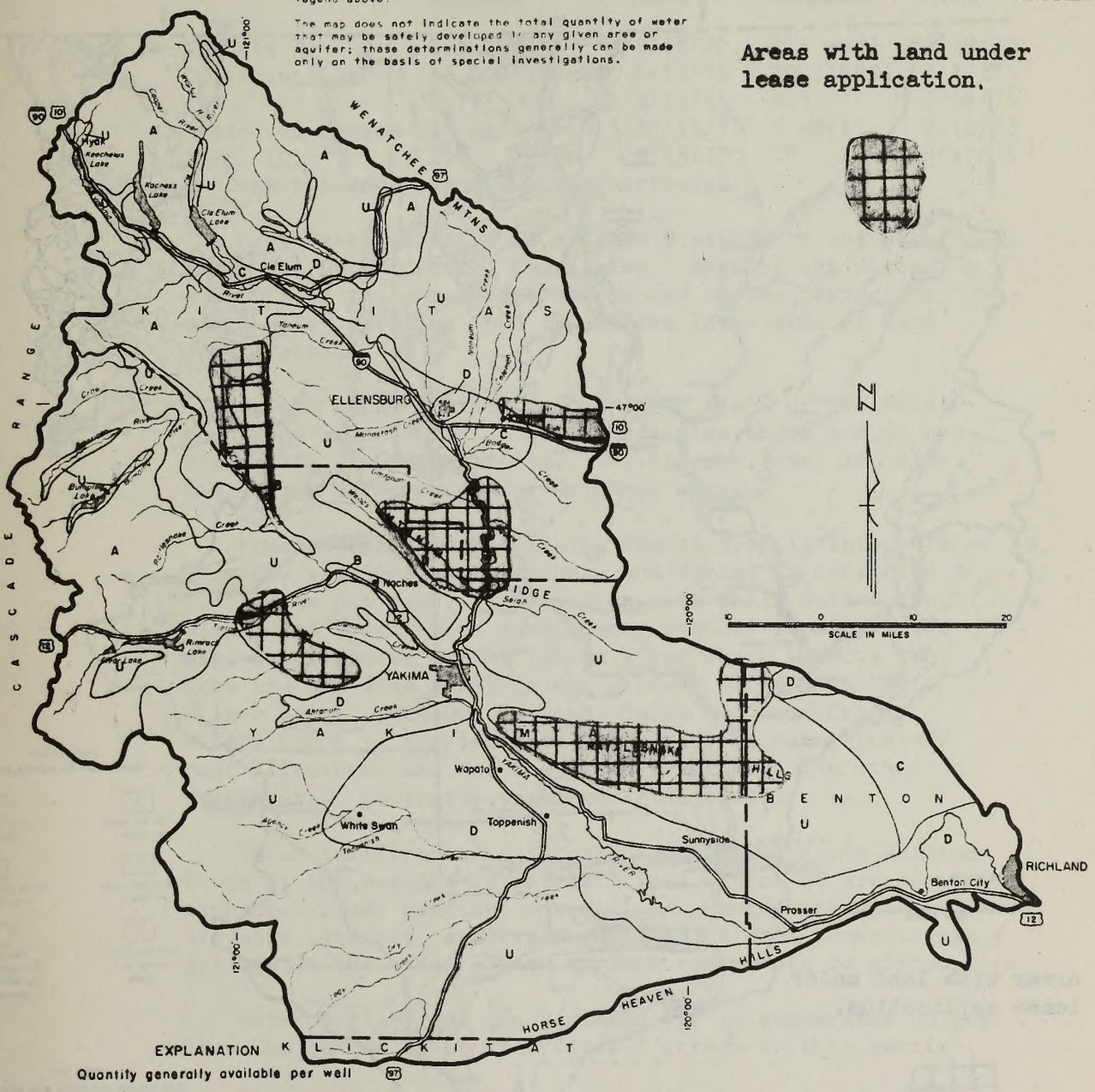
Crab Creek had a monitoring station at Beverly near its mouth. On five occassions during the period of October 1974 to September 1975, the water quality at various flows

LIMITS OF YIELD

The map shows areas where properly located and properly constructed wells generally are capable of yielding amounts of water within the limits specified in the legend above.

The map does not indicate the total quantity of water that may be safely developed in any given area or aquifer; these determinations generally can be made only on the basis of special investigations.

Areas with land under lease application.



EXPLANATION

Quantity generally available per well

A — 1 to 20 gallons per minute	B — 20 to 100 gallons per minute
C — 100 to 500 gallons per minute	D — 500 to 2000 gallons per minute
E — More than 2000 gallons per minute	U — Yield unknown. See aquifer unit map for information on possible yields

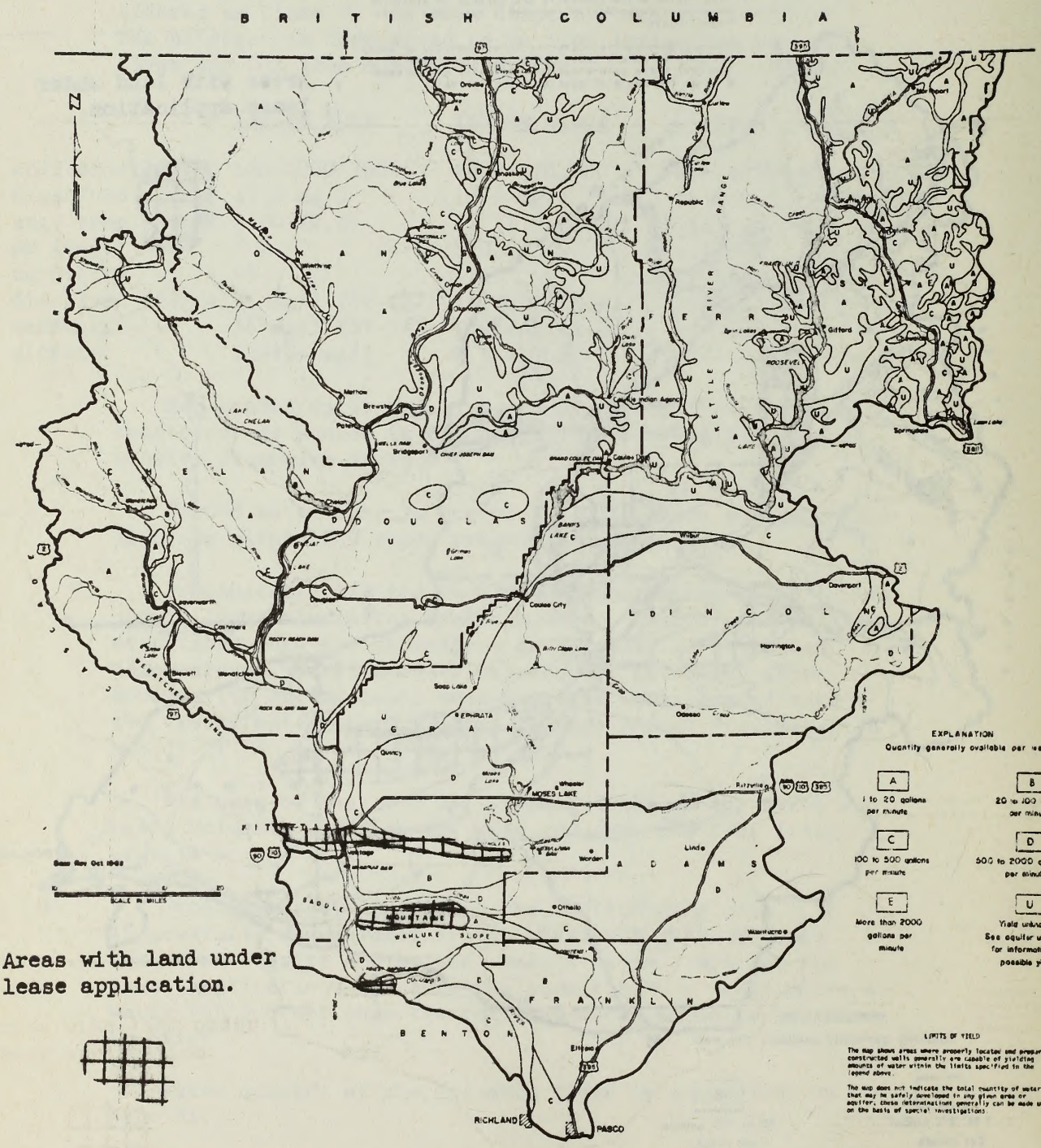
COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

GENERAL AVAILABILITY OF GROUND WATER

YAKIMA SUBREGION 3

1968

Map - II-4



Areas with land under lease application.

COLUMBIA-NORTH PACIFIC
COMPREHENSIVE FRAMEWORK STUDY

GENERAL AVAILABILITY OF GROUND WATER

UPPER COLUMBIA SUBREGION 2

1968

Map - II-5

was monitored. The maximum and minimum results were:

	Maximum	Date	Minimum	Date
Nitrate	1.5 mg/1	8/18/75	1.1 mg/1	5/19/75
Coliform	37,000/100ml*	8/18/75	200/100ml	3/17/75
pH	8.7*	8/18/75	8.3	5/19/75
Dissolved Oxygen	13 mg/1	10/21/75	8 mg/1	8/18/75
Temp. (C)	21°	8/18/75	7°	3/17/75

*Does not meet class B stream criteria.

Crab Creek is rated as a Class B stream by the Washington Water Pollution Control Commission. Most of the degrading elements of the stream are attributed to the irrigation waste water spilling into it and the large area of farm land drained.

Ground water quality on the south flank of the Saddle Mountains as measured in wells indicates there are no problems with any contaminants. The nitrate level is below the 45 ppm recommended for drinking water.

Precipitation in the Yakima Canyon area is interpolated from the stations at Ellensburg and Yakima is estimated at 7.8 inches per year. The greater part falls during the winter and spring with some summer thunder showers. The main water course is the Yakima River which bisects the area and has five small feeder streams within the unit. Wilson Creek, Umtanum, Burbank, Squaw and Roza Creek. Wilson Creek is supplemented by irrigation water run off near Ellensburg and has the largest inflow. The other creeks drain generally sagebrush-grasslands.

Water infiltration into porous areas among the deformations of the basalts is the principal source of ground water recharge. Down gradient movement of ground water in aquifers of sands, gravels, and fractured basalts feed numerous named springs in the area. These springs contribute to stream flow.

Water quality for the Yakima River is summarized on page 52. The Yakima River is a Class A stream in this section.

There is only one other stream in this unit with a water monitoring station and that is Wilson Creek near its confluence with the Yakima River. Wilson Creek's quality is degraded by nutrients from farm land and the waste irrigation water. There are no radiological, sediment load or

dissolved solids monitoring at this station for the record year of 1973.

	Maximum	Date	Minimum	Date
Nitrate	1.1mg/1	4/10/73	.31 mg/1	1/23/73
Coliform	45,000/100 ml	7/24/73	100/100 ml	3/20/73
pH	8.6	4/10/73	7.3	11/29/73
Dissolved Oxygen	14.5 mg/1	4/10/73	7.7 mg/1	11/15/73
Temp. (C)	18	8/14/73	0°	12/13/75

Rattlesnake Hills averages about 7.2 inches of precipitation usually in the winter months. Evaporation rate is higher than the precipitation rate during most of the year. There is little run off except during spring snow melt. Most of the water runs into the gravels of the Moxee-Dry Creek and Cold Creek Valleys on the north and the gravels of the Yakima on the south. With the exception of the Yakima River none of these drainages run year long.

Groundwater moves toward the Yakima Valley down the flanks of the Rattlesnake anticline and along the Moxee-Dry Creek syncline. Ground water is usually found near the lower elevations away from the applications. However, there are some interbasalt aquifers known to underlie the applications on the Cold Creek and Moxee synclines.

The portion of the Yakima River most directly affected by these applications is rated as Class B. A small portion of the Columbia River is also affected; it is rated as Class A.

The Yakima River data is summarized on page 52. In this area it is degraded by waste water from irrigated farm lands, municipal wastes, feed lots, urban run off and irrigation water withdrawals.

Ground water along the fringes of the application areas is generally good. There is some withdrawal for irrigation at Cold Creek, east of Moxee and in numerous wells along the south side near the irrigation laterals.

The mean annual eastside precipitation in the Wenatchee National Forest is about 20 inches. Annual average precipitation for the entire national forest is approximately 35 inches. Moisture is the limiting factor in plant growth

in the area. Because the ground is porous, there is almost no surface runoff on the vegetated areas. Eighty percent of the precipitation falls as snow between the period of October 1 to April 15. The snow melt usually infiltrates directly into the ground with very little runoff.

Major streams within the area are the South Fork Manastash, the Naches and the Tieton all of which have tributaries which run water year round. These streams are all rated as Class AA in this area. Stream channels indicate an occasional flooding usually as a result of a rain or Chinook wind on top of a heavy snow covering. Generally rains and snow melt percolate readily into the soil to feed the subterranean water table. There should be no significant increase in amount of contaminants such as dissolve solid chemical, heavy metal, toxic substance, nutrient solid debris and coliform contamination. Changes in pH alkalinity, dissolved oxygen and water temperature should be minimal. These chemical and physical characteristics determine what aquatic animal and plant life these small streams will support.

In the Frenchman Hills, annual precipitation averages 6.6 inches. This value was calculated from Ellensburg and Othello climatological stations. In the summer months less than one inch is usually recorded while the winter months receive the majority of the moisture. This rainfall either evaporates or drains into the Frenchman Hills waste water system and Columbia River.

North and adjacent to Frenchman Hills lies a network of lakes and potholes. These waterways originally formed when Grand Coulee Dam was constructed. As the water level rose behind Coulee Dam, water migrated to the south between basalt flows. Much of the basin area south of Coulee Dam is flood irrigated causing water to move through the porous top soil and accumulate against the basalt. The Frenchman Hills anticline acts as a ground water dam which produces numerous springs north of the area. These springs contribute to the Frenchman Hills wastewater system and potholes.

Three lease applications in the Frenchman Hills area lie adjacent to or on bodies of water. OR-13786 lies adjacent on both sides of the Columbia River approximately three miles upstream from the Vantage I-90 Bridge. OR-13782, and 13783 overlie some of the Frenchman Hills waterway network just

north of the Frenchman Hills and west 5 to 13 miles from Potholes Reservoir.

There are no water quality monitoring stations on the three lease applications mentioned. However, the Columbia River at this point would be basically the same as listed on page 51. More detailed information for specific sites is available from references as listed in the appendix.

The Bureau of Reclamation, Ephrata, Washington, has participated in extensive checks of water flow and ground water tables in the basin area. Specific sites should be checked with available information before drilling is actually allowed to commence.

B. Living Components

There are numerous sources for lists of plants and animals commonly found in the Columbia Basin and the lease application area in general. Public libraries and universities as well as county, state and Federal agencies have these lists available. Therefore, a detailed list is not included in this report. The list of references at the end of this report indicates some of the plant and animal references available.

1. Plants

a. Plants (Aquatic)

Vegetation is a vital component of aquatic ecosystems because plants are the beginning of the food chain, only they can fix biochemical energy and synthesize basic organic substances.

Some aquatic plants grow in nearly all waters flowing through or standing on the subject lands. Species distribution depends upon water temperature, water depth and movement, available nutrients, salinity, light for photosynthesis, and sufficient time for growth and reproduction.

Water habitat on the proposed lease areas can be classified as either running water habitat or standing water habitat. Running water habitat includes streams and rivers while standing water habitat includes lakes, reservoirs, ponds, and marshes.

Representative aquatic plant species widespread in the Columbia River Basin and likely to be found on subject land are listed as follows:

Floating and vascular plants: Some pondweed, elodea, duckweed, water persicaria, hornwort, cat-tail, water milfoil, horsetail, bulrush, sedge, willow, stonewort, buttercup, bladderwort, water plantain, watercress, pond lily, burreeds, spikerushes, and canarygrasses.

Phytoplankton: green algae, golden-brown algae and diatoms, and blue-green algae.

Streamside vegetation is not as well developed along the Columbia River shore as it is along over rivers that flow through arid lands. This is partly due to the presence of boulders, cobble and gravel substratum along the Columbia. The widely varying flows resulting from the power flow fluctuations cause large areas along the river shoreline to be alternately wet and dry during each day. These characteristics have precluded the full development of a rooted aquatic community such as is commonly found in sloughs and backwaters. However, there are aquatic plants that do grow in the cobble substratum.

Plants that have been tentatively identified in research literature as deserving special consideration in land management activities and possible occurring on the subject lands are: Robinson's onion (Allium robinsonii) - distribution along Columbia River from Vantage to John Day River, wild chives (Allium schoenoprasum) - distribution restricted to gravel bars of the Columbia River in the vicinity of the Hanford Complex, Dutchman's breeches (Dicentra cucullaria) - distribution along sandy banks along Columbia River.

b. Plants (Terrestrial)

Big sagebrush-bunchgrass and bunchgrass communities dominate the undeveloped lands of the Columbia Basin. The major species in the shrub community would be big sagebrush, spiny hopsage, bitterbrush, and rabbitbrush. The major species in the grass community would be bluebunch wheatgrass, needle and thread grass, cheatgrass, Indian ricegrass, Cusick bluegrass, Idaho fescue,

squirreltail and Sandberg's bluegrass. The major species in the forbs community would be lupine, balsamroot, buckwheat, vetches and numerous annuals.

In some areas where soil and moisture conditions are favorable, portions of the native range have been artificially treated to increase forage production. Sagebrush has been killed generally by spraying to eliminate competition with the native grasses. Other areas have been plowed and seeded primarily with crested wheatgrass.

Species, stands or communities which have been recognized in literature as deserving special consideration in land management actions are listed as follows:

T.15N., R.23E., juniper stands along the Columbia River near the mouth of Crab Creek are considered a vegetative type unusual to that region.

T.17N., R.15E., Rocky Prairie contains the largest bitterroot area in the Yakima Area. In addition, death camas (Zigandus spp), common camas (Camassia spp), wild peonies (Paeonia spp), lupine (Lupinus spp), and white phlox (Phlox spp) are found there.

T.16N., R.18 & 19E., Manastash Ridge is known for its abundance of wildflowers including bitterroot and tweedy Lewisia (Lewisia spp), and the rather rare dwarf hesperochiron (Hesperochiron pumilus).

The Winterfat (Eurotia lanata) community is the only known location in the State of Washington where the plant is found in significant quantities on Federal lands in the lower south slopes of Saddle Mountains.

Thyme Buckwheat (Erigonum thymoides), a threatened species much sought after by miniature plant hunters and possibly occurring on sagebrush lands in the Columbia Basin.

Wild daisy (Erigeron basalticus), a naturally rare plant found along cliff crevices in the Salah Creek drainage in Yakima County.

Grey oreocarya (Cryptatha leucophaea), known to occur on dry slopes along Columbia River from Wenatchee to the Dalles.

Rattlesnake Hills Research Natural Area, located T.11 &12N., R.24E., is east of the proposed lease applications OR 13673 and OR 13495 in R.24E. The adjoining research area contains outstanding examples of sagebrush, bunchgrass, and spiny hopsage in undisturbed condition.

Yakima River Canyon, a unique cactus is endemic to this area. The hedgehog cactus, sometimes referred to as Simpson's cactus (Pediocactus simpsonii), is found in arid sections and is one of the most unusual plants growing in the state.

2. Animals

There are four life zones represented within the area of the proposed oil and gas leases. The zones are described in the "Washington Environmental Atlas", prepared by U.S. Army Corps of Engineers.

The four zones are: Canadian (C) - 2,000-5,000 feet in elevation, Arid Transition Timbered (ATT) - 1,800-3,000, Arid Transition Grassland (ATG) - 1,500-2,400, and Upper Sonoran (US) - 200-1,900. For further description of these zones reference is directed to the above atlas located in the Spokane District Office.

The greatest portion of the lease application area falls within the last two life zones, however the description of the environment will be considered as one basic unit with specific references to local areas when deemed appropriate.

Identification of 59 species of mammals, over 247 species of birds, over 34 species of fish and 26 species of reptiles and amphibians has been made in the lease application area.

Information was obtained from the appropriate URA's and other resource material as cited. More detailed data may be obtained on species distribution and habitat as described in the Saddle Mountain, Yakima River, Rattlesnake, Johnson Creek and South Colockum URA's.

A listing of the important species of wildlife present will be discussed within the narrative along with the identification of their status as individual elements of the environment. A comprehensive list of wildlife present, and those species known to be in specific areas, are found

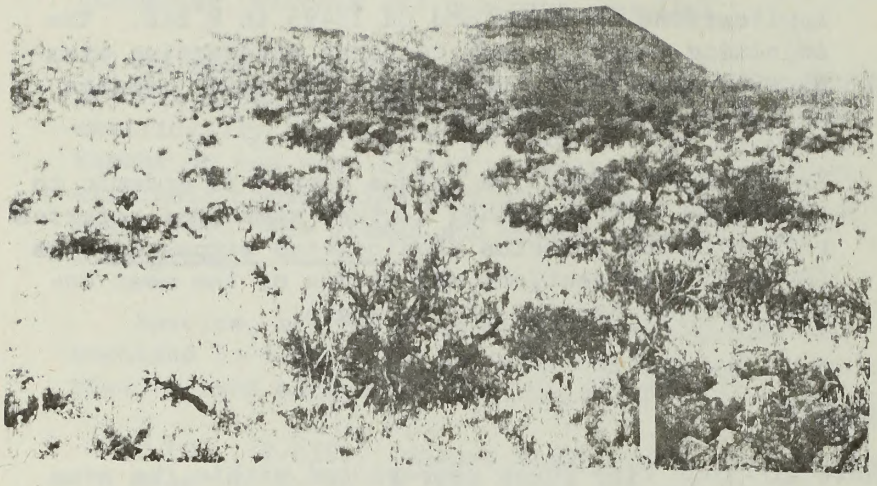


Figure II-6 Typical range land in lease application areas - cheatgrass, sagebrush in foreground, bluebunch wheatgrass on hillside behind.

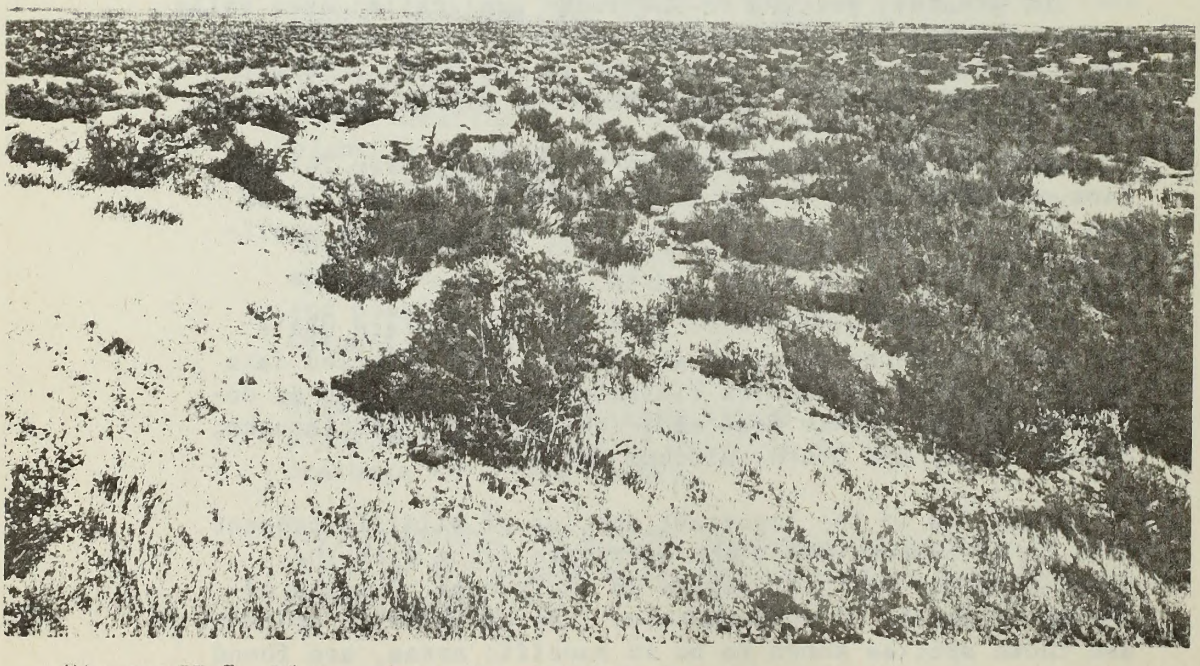


Figure II-7 Flats along the Columbia River north of Hanford Works. Mainly cheatgrass and sagebrush in foreground.

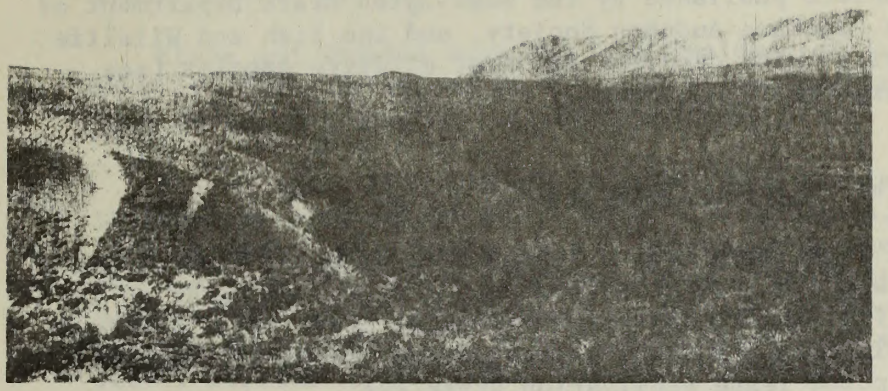


Figure II-8 South Johnson Creek area - looking south towards Saddle Mtn. area. A rocky shallow soil type covered with Sandberg bluegrass and stiff sage.

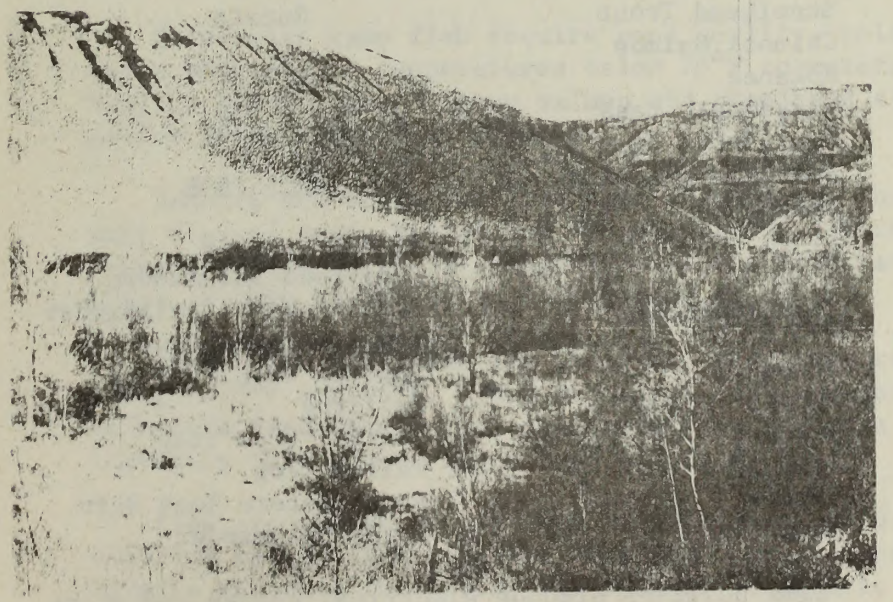


Figure II-9 Yakima River Canyon - looking northwest, freight train on track along river. Typical canyon range in the distance, hardwood brush in foreground.

in the "Washington Environmental Atlas", and in the district URA's.

There are also available special descriptive maps and pamphlets published by the Washington State Department of Game, Spokane Audubon Society, and the Fish and Wildlife Service which describe and list wildlife species (see references in Appendix).

a. Animals (Aquatic)

Animals present under this category live in the water or are dependent upon a source of water to fulfill their needs and to support their life functions. Important aquatic animals which are within the proposed lease application areas are:

Game Fish	Mammals (also terrestrial in habitat use)
Rainbow Trout	Mink
Cutthroat Trout	Raccoon
Brown Trout	Muskrat
Dolly Varden	Beaver
Brook Trout	Otter
Steelhead Trout	Nutria
Chinook Salmon	
Kokanee	
Largemouth Bass	
Smallmouth Bass	
Mountain Whitefish	Amphibians
Crappie	
Perch	Painted turtle
	Long-toed salamander
Non-game Fish	Pacific giant salamander
	Rough-skinned newt
Carp	Spotted frog
Sucker	Bullfrog
Dace	Pacific tree frog
Sculpin	Tailed frog
Lamprey	Northwestern Toad Bufo
Squawfish	Tiger Salamander

Dams built to produce electrical energy and store water for irrigation have adversely affected various species of anadromous fish on many of the rivers and

streams once utilized. Natural production of native salmon and trout has been tremendously reduced because of land use such as logging and irrigation of agricultural crops which has resulted in lower water levels, sedimentation and pollution of streams.

State and Federal agencies have implemented intensive artificial programs to increase salmon and trout as a mitigation measure for the dams being built.

The Columbia River is the primary river flowing through the lease application area. The Columbia, Yakima, Naches and Tieton are all important to the salmon and steelhead fishery in Washington. These streams also contain important populations of trout. They and streams such as Crab Creek, Manastash Creek, and small feeder streams to the Yakima River, contain trout populations planted and maintained by the State of Washington.

The Tieton and Naches Rivers flow from the Wenatchee National Forest, through and adjacent to the proposed lease application area, and into the Yakima River.

Game fish are divided into cold water and warm water species.

Cold-water game fish require good quality, cold water with summer temperatures below 70°F to maintain healthy populations. Young salmon and steelhead also prefer these habitat conditions.

Insects and other small aquatic animals are the main diet of young salmon and various trout. Therefore, a healthy food chain is important. As the fish mature there is more predation on small fish.

Warm water game fish can tolerate water temperatures between 75°F and 85°F. They can also utilize waters with less dissolved oxygen concentrations and more turbidity than either the salmon or trout.

Fish are important not only because of their direct benefits to man as a resource, but also because they help to maintain the ecological balance in aquatic ecosystems.

The stream flows in the lease application area are reduced during the summer because of irrigation use and low rainfall. This causes water temperatures of small streams to rise to critical levels for survival of cold water fish.

Stream side vegetation is important in maintaining cooler water temperatures and reducing the erosion and sedimentation by stabilizing the streambanks.

Ideal water requirements which are considered best for aquatic life in the life zones are:

Water temperature - 50° to 60°F (summer for cold water species)
Dissolved Oxygen - 7 to 9 ppm
Hydrogen Ion (pH) - 6.8 to 7.8
Total Dissolved Solids - 150 ppm
Jackson Turbidity Units - 5 or less (summer)

b. Animals (Terrestrial)

A wide variety of wildlife are to be found within the areas of proposed oil and gas lease applications. This is primarily due to the elevation change and the availability of water within four different life zones. These variations provide many niches and diverse habitats for animal life.

The following terrestrial animal families are among those found within the general area of the proposed oil and gas leases.

Mammals
Cattle, Domestic - (Bovidae)
Deer - (Cervidae)
Bighorn Sheep - (Bovidae)
Bears - (Ursidae)
Antelope - (Antilocapridae)
Coyotes & Foxes - (Canidae)
Squirrels - (Sciuridae)
Moles - (Talpidae)
Mice, Rats & Voles - (Cricetidae)
Shrews - (Soricidae)
Beavers - (Castoridae)
Wildcats & Cougar - (Felidae)
Rabbits & Hares - (Leporidae)
Weasels - (Mustelidae)
Bats - (Vespertilionidae)

Reptiles & Amphibians
True toads - (Bufonidae)
True frogs - (Ranidae)
Garter & Gopher snakes - (Colubridae)
Rattlesnakes - (Viperidae)

Insects & Arachnids
Grasshoppers - (Acrididae)
Wasps & Hornets - (Vespidae)
Ants - (Formicidae)
Butterflies - (Danaidae)
Moths - (Lymantridae)
Flies - (Muscidae)

Birds
Hawks & Eagles - (Accipitridae and Falconidae)
Vulture - (Cathartidae)
Owls - (Tytonidae and Strgidae)
Jays, Magpies & Crows - (Corvidae)
Grouse - (Tetraonidae)
Ducks, Geese - (Anatidae)
Woodpeckers - (Picidae)
Wrens - (Troglodytidae)
Finches & Sparrows - (Fringillidae)

Mammals:

Mule deer and whitetail deer populations are low over the greater portion of the study area. Densities are less than one deer per square mile in the Saddle Mountain, Frenchman Hill's and Rattlesnake area. Larger deer populations are to be found in the foothills of the Cascades northeast of Yakima with 7.8 deer per square mile in the Wenatchee National Forest.

Some deer migration does occur, with winter range being used by deer on the lower foothills, draws, and along the river bottoms.

Elk are to be found on three of the study areas, the Wenatchee National Forest, Yakima River and the west end of the Frenchman Hills. Winter snows force the elk down into the lower portions of the Yakima Canyon along the river where they can be seen by motorists. Washington State Game Department has estimated a 5.9 elk per square mile for the Wenatchee National Forest and Yakima River area. Critical winter range is deliniated on the Wildlife Habitat Map, II-10. The Wenatchee National Forest and the Yakima River areas contain black bear in good numbers and a small population of bighorn sheep. The area of critical winter range used by the bighorn is on the Wildlife Habitat Map, II-10.

Antelope are scarce but can be found in Grant, Kittitas, and Yakima Counties. There are estimated to be about 100 antelope in Washington. This species may never reach huntable populations in Washington. Antelope band together during the winter and late summer. The young are born in late May or early June with twins being common. The Washington population in the study area has been decreasing for many years.

Coyotes are abundant and found in all habitats throughout the lease application area.

Cougar and bobcat are present in the lease application area but rarely seen.

The Whitetail Jackrabbit is under consideration for the threatened species list by the State of Washington, and is found throughout the lease application area in limited numbers.

Domestic livestock which includes cows, horses and sheep are found in all lease application areas.

Birds:

A wide variety of bird species utilize the area, especially where vegetative types are diverse and intermingled. Streams, rivers, lakes and marshes provide an edge effect to supply food, cover, and water necessary to carry out life functions.

The larger portion of bird use is seasonal due to migrations but an important use is fulfilled by all habitats made available.

Several crucial habitat areas necessary to sustain and maintain important wildlife species are:

Strutting grounds for sage grouse located in sec. 12, T.15N., R.24E., and sec. 8, T.15N., R.25E. are critical spring use areas and activity by man should be minimized.

The Yakima River area is outstanding habitat utilized by a variety of raptors. Although the State of Washington has not formalized a "threatened" species list, the following species of birds are under consideration as threatened in Washington and are found throught the study area in small numbers.

Western Burrowing Owl (Speotyto cunicularia)
Northern Long-Billed Curlew (Numenius americanus)
Columbian Sharp-Tailed Grouse (Pediocetes phasianellus)
Ferruginous Rough-Legged Hawk (Buteo regalis)
Bald Eagle (Haliaretus leucocephalus)
Prairie Falcon (Falco mexicanus)

Pigeon Hawk (Falco columbaris)
Golden Eagle (Aquila chrysaetos)
American Osprey (Pandion haliaetus)

Prairie falcon and golden eagle nests have been located within the Yakima River area. Spring nesting periods are critical.

Game Birds:

Some of the game birds present in exceptionally good numbers within their habitat are chukar, pheasant, and California valley quail.

Low populations of sage grouse are present in isolated groups within areas of sagebrush habitat.

Migratory mourning dove are well distributed throughout the area and receive heavy hunting pressure each year.

Waterfowl:

The Columbia National Wildlife Refuge, Potholes Reservoir, Columbia River and Yakima River attract large numbers of ducks, geese, and shore birds each year. There are several state wildlife recreation areas within or adjacent to the proposed oil and gas lease study area:

Wildlife Recreation Area	County	Acreage	Principal Wildlife
Desert Potholes	Grant	65,000	Waterfowl, pheasant, trout, spinyrays
Crab Creek	Grant	20,918	Waterfowl, pheasant, chukar
Colockum	Chelan-Kittitas	105,163	Elk, deer, bighorn sheep, turkey, quail, chukar, waterfowl
Oak Creek-Wenas	Kittitas	101,000	Elk, deer, chukar, quail, trout, elk feeding station in winters
L. T. Murray	Yakima-Kittitas	102,800	Elk, chukar, deer, trout, grouse
Wahluke Slope	Grant	57,800	Waterfowl, chukar

Amphibians and Reptiles:

Amphibians are limited in their distribution to open surface water adjacent to lakes, streams, rivers and marshes. A change in water levels or vegetative types can be critical to the densities of various species.

Reptiles are well distributed throughout the area.

Invertebrates:

The more common insects in the area are grasshoppers, bees, hornets, flies, wasps, mosquitoes, moths, borers, spiders, mites, ticks, and beetles.

Forest insects that are common pests in this area include the larch case bearer, pine butterfly, Douglas-fir tussock moth, tent caterpillars, flat headed borers, round headed borers, red turpentine beetle, mountain pine beetle, Douglas-fir beetle, western pine beetle, fir engravers, gall aphids and spruce budworm.

Man:

Influences by man are evident throughout the area because of various activities such as: domestic livestock grazing, building of roads, timber harvesting, placement of buildings, fences and other facilities, and general recreational activities such as hunting and off road vehicle use.

3. Life Zones

A life zone overlay provides a workable means of mapping broad distributions of flora and fauna. American biologist, C. Hart Merriam, initially proposed the system in 1894 and designed it for the ecological classification of large scale environments. C. V. Piper in 1906 modified Merriam's system to adapt it to Washington's unique terrain. ERTS satellite imagery was used in 1974 to update Piper's portrayal of Washington's life zones.

Zoologists have long used Merriam's system of life zones to describe the general distribution of animal population while botanists have continuously reworked, redefined and

updated their life zone system for the state. In order to avoid confusion in terminology, the different terms frequently used to describe life zones by zoologists and botanists essentially correspond in the following manner:

Merriam	Daubenmire
1. Artic-Alpine Zone	1. Alpine Zone
2. Hudsonian Zone	2. Subalpine Zone
3. Canadian Zone	3. Subalpine Zone
4. Humid Transition Timbered Zone	4. Montane & Lowland Forests West of the Cascade
5. Arid Transition Timbered Zone	5. Forests of dry to moderately dry climates
6. Arid Transition Grassland Zone	6. Steppe
7. Upper Sonoran Zone	7. Steppe

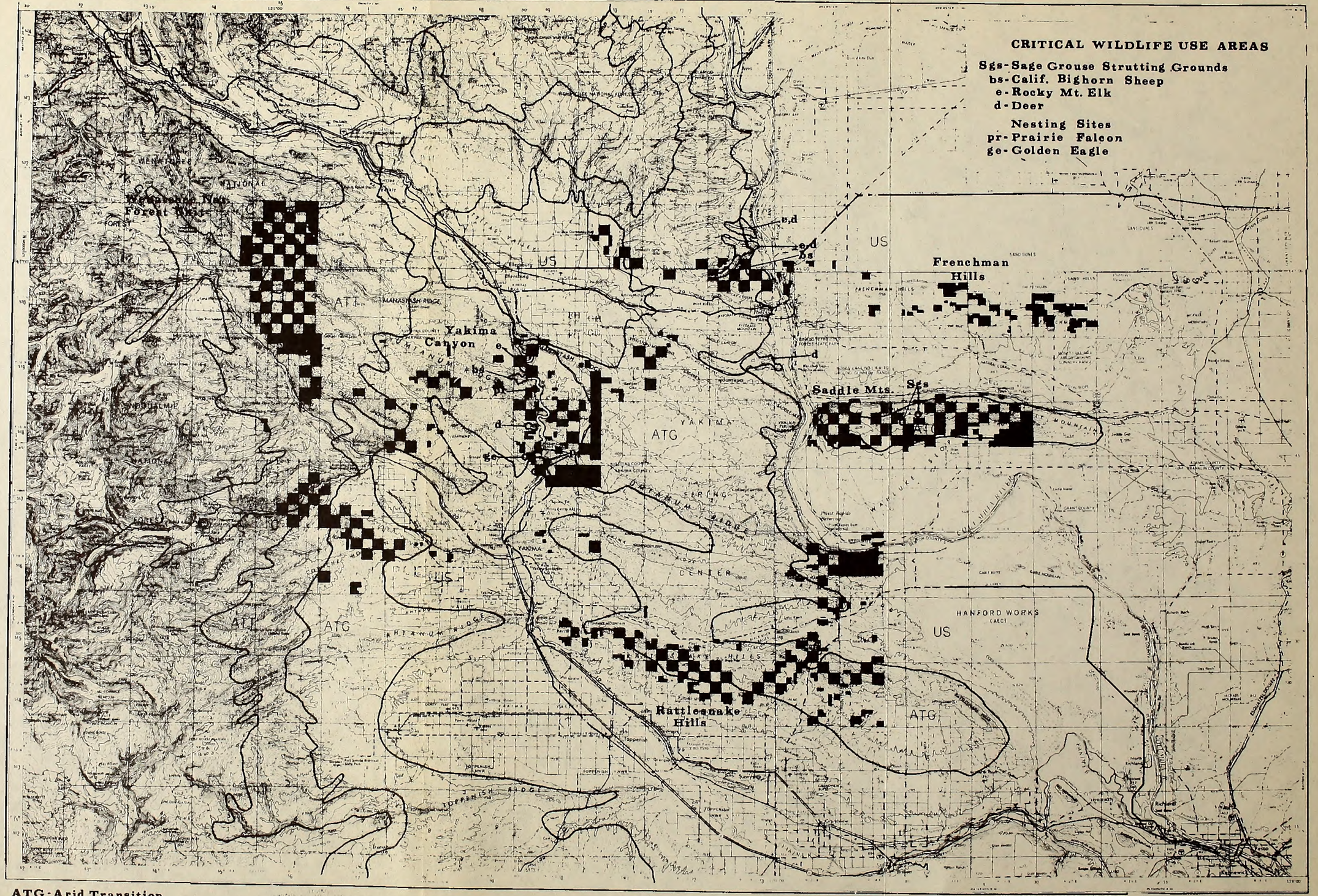
See Life Zone Map II-10.

C. Ecological Interrelationships

The ecological process within the designated area is complex and diversified due to the variety of sites and corresponding plant communities. It would be unrealistic to attempt to describe in detail all interrelationships in a document such as this. The following basic statements are intended to give merely a broad overview of the more prominent ecological patterns that may be related to this proposed action.

Proposed lease application areas in the Columbia Basin lie either in the Arid Transition Grassland Life Zone or the Upper Sonoran Life Zone. Lands in the Wenatchee National Forest lie either in the Arid Transition Timbered Zone or the Canadian Life Zone. A life zone is a series of natural communities of plants and animals existing in a specific physical environment.

In the Arid Transition Grassland Zone the most important species of grass is blue-bunch wheatgrass, but many other grasses are present and there are many broad-leafed species which flower during the spring when there is still abundant moisture in the soil. In this zone shrubs are common along streams and in wetter depressions. Temperatures are favorable for plant growth most of the year, but production is severely limited by moisture shortage during late spring, summer and autumn.



ATG-Arid Transition Grassland
ATT-Arid Transition Timbered
C-Canadian
US-Upper Sonoran

LOS ANGELES
OMAHA
GALVESTON

LANDS UNDER LEASE APPLICATION AS OF Feb. 28 1976

OIL & GAS LEASE APPLICATION MAP II -10
Life Zones

BUREAU OF LAND MANAGEMENT
SPOKANE DISTRICT OFFICE
SPOKANE, WA. 99201

In the Upper Sonoran Zone, the lands are extremely arid and support a "shrub-steppe" vegetation with various grasses and herbs growing among the shrubs. Vegetative productivity is limited because of moisture shortage.

In the Arid Timbered Transition Zone, ponderoza pine normally forms almost pure stands on the lower slopes just above the grassland. Douglas-fir is dominate at higher elevations. This does not always hold true on the Wenatchee National Forest. In wetter sites there is a rich understory of shrubs and the river bottoms support a distinctive vegetation dominated by deciduous trees with dense understories of shrubs and herbaceous plants. Winters are cold and there is considerable accumulation of snow at the higher elevation, but this decreases at lower elevations. Slopes are usually bare by early April. Summers are long, usually hot and dry, and forest fires are a constant danger. Because of the drier condition, the forests of the Arid Timbered Transition Zone are more open and characterized by an abundance of many species of grasses.

The Canadian Life Zone is characterized by a dense conifer forest. A rich understory of shrubs occur in many areas, but the diverse wet meadows of higher elevation are scarce and scattered. Snow cover is deep but because of mild climate conditions the ground becomes exposed in the spring and there is a moderately-long growing season for plants. The high productivity of the vegetation results in formation of a rich humus layer in the soil which support large numbers of saprophytic plants. Most conspicuous are fungi, various orchids and a number of plants of the heather family.

1. Plant Succession

In the Columbia Basin the big sagebrush - blue bunch wheatgrass association, is the vegetative climax on the subject lands. An abundance of Cusick bluegrass appears in the association when the site takes on a north exposure and the range is in good condition. The smaller perennial Sandberg bluegrass is also present and tends to increase in the composition with over use and deterioration of the larger bunchgrasses.

At the present time much of the area is in a disturbed (transition) condition and is not producing climax vegetation. Changes in the climax association have been

caused by cultivation, fire and cattle grazing. The predominately cheatgrass associations are a result of past fires burning off the shrub overstory, livestock overgrazing the exposed bunchgrasses, farmlands being abandoned. This allowed the annual cheatgrass to invade the area. The pure bunchgrass association may be the result of fires burning off the sagebrush overstory and the surviving bunchgrass not being overgrazed.

The three tipped sage association is a soil related association and generally occurs because the soil is too rocky and shallow to support the growth of the more desirable perennial plants. The winterfat association is also soil related. This plant is able to survive on limy soils where other shrubs and perennial grasses cannot grow.

In many locations on the Wenatchee National Forest there is no climax ponderosa pine forest between the grassland and Douglas-fir forest. Ponderosa is climax generally on areas that have quaking aspen or lodgepole pine in the association. Ponderosa is transitional to Douglas-fir in stands where the principal understory dominant is pinegrass. Because ponderosa pine is more fire resistant than most associated tree species, fire has had a profound effect on its distribution. Periodic fires in the past served to maintain ponderosa in areas where, without fire disturbance, the climax tree species would have attained dominance. Fire control activities during the past 60 to 70 years have on the moister sites resulted in gradual replacement of ponderosa pine by such species as grand fir and Douglas-fir. If allowed to continue, these areas would likely be a grand fir climax.

Associations in which Douglas-fir is climax are generally the next zonal step in eastern Washington. In places the climax Douglas-fir may border the shrub-grassland zone. Douglas-fir is climax but lodgepole pine or western larch may dominate forest stands because they are better adapted to fires.

Major tree species in the Grand Fir Zone are grand fir, ponderosa pine, lodgepole pine, western larch and Douglas-fir. Any of the four associates listed here may dominate transitional forest stands. Grand fir is the major climax species. Most grand fir stands can be related to the Grand Fir/Pachistima habitat type in Eastern Washington. Most transitional species attain optimum growth in the Grand Fir Zone.

The Bitterbrush/Bluebunch Wheatgrass Association is found in the Shrub-Grass Zone and occurs as climax. Shallow soil and low rainfall characterize this association.

2. Food Relationship

Within the subject lands there are numerous food relationships between plants and animals and among animals themselves. All are dependent initially upon the production of food material by green plants.

An example of basic relationships that exist within an area where native vegetative cover has increased would be as follows: Small rodents would use the increased cover for food and escape cover. Birds would use the seed and grass production for food, nesting cover, winter cover, and escape. Insect production, important to small mammals such as the vagrant shrew and to birds for egg shell protein and blood development, would increase. With an increase in small mammals and birds, there would be an increase in use by birds of prey. Falcons, like the prairie falcon and sparrow hawk, would use the small birds for prey while the redtail, ferruginous, and rough-legged hawks would prey upon the increased small mammal population. Owls would utilize the insects and the small mammals. The small mammals and insects would utilize the birds vegetative cover for food. Bobcats and coyotes would feed primarily on small mammals with occasional prey including insects and birds. Man's relationship to this food chain is concerned primarily with the harvest of coyote and bobcat for fur and small game such as cottontail, chukar, partridge, pheasant and quail for food.

Water is a critical part of all the food relationships. The seasonal and geographic distribution of water supplies for livestock, wildlife, and plants often dictate the population and distribution of these communities. An improved spring may provide water critical to an intensive grazing system, improve habitat for a wide range of wildlife species such as deer, upland birds, and songbirds, and improve watershed conditions by relieving pressures on existing water supplies. The water supply is often the limiting factor in the food chain.

For more detailed and site specific information on food relationships see the Saddle Mountain, Yakima River, Rattlesnake, Johnson Creek and South Colockum U.R.A.'s on file in the Spokane District Office.

3. Community Relationships

Plants are dependent upon the soil for moisture, nutrients, and physical support. The soil is dependent upon the plant for organic matter, stability from erosion, and microbial activity.

The soil-animal relationship is important to both the animal species and the soil. The animals, insects, nematodes and protozoa are important to the soil in that they start the conversion process of changing organic matter into minerals and nutrients, which in turn can be used by growing plants. Many insects and small mammals are dependent upon the soil for cover or habitat in which to live.

Animals are dependent upon the plants. Inadequate cover and forage decrease the value of animal habitat. The reduction of browse by wildfire and vegetative treatment has often reduced wildlife forage and cover but improved livestock forage and watershed conditions. On other areas over-grazing by domestic animals has allowed an increase in browse with a corresponding decrease in palatable forbs and grasses; this may have improved wildlife habitat while the livestock conditions deteriorated.

D. Human Values

1. Landscape Character

The most basic natural feature of the Columbia Basin physiographic area is the east-west alignment of the ridges and valleys which cross the Columbia River and merge with the eastern edge of the Cascade Range. These ridges and valleys lie 15 to 30 miles apart and form continuous lines of ridges and rolling summits. Highways follow the east-west direction in the valley bottoms. The hills are generally 500 to 2500 feet high, sagebrush and grass covered with little or no tree cover. Land forms in the study area are primarily rounded, rolling hills, with many small, and some large eroded canyons. Where the Yakima and Columbia Rivers cut through the Saddle Mountains the side slopes are steeper, more eroded, and more interesting. In these areas basaltic lava flows are exposed and rock coloration is more evident.

Three areas which have unusual landscape features typical of the Columbia Basin but different from each other are the Yakima Canyon, southeast portion of the Wenatchee National Forest, and the Saddle Mountains. These areas are identified in more detail.

The Yakima River Canyon is a highly scenic area approximately eighteen miles long and one mile wide where the Yakima River cuts through the Umtanum and Manastash Ridges. The canyon is unusual for the Columbia Basin physiographic area with its average depth of 1,500 to 2,000 feet and sharp canyon walls dropping to the river bottom.

The viewer finds himself in an enclosed landscape surrounded by continuous groupings of canyon walls, with the eye continually looking up or ahead to a new focal feature or unusual object around each turn of the road. Sidewalls of many canyons have been carved through erosion on both sides of the river; most are dry but some have small springs in them which are wet most of the year. Ridges and rock outcrops form sharp angular lines on the hills above, while unusual rock forms from different geologic periods present different gold or brown to red-brown colors as the viewer moves through the canyon.

The Saddle Mountains are a series of low mountain summits which run east and west. Where the mountain chain crosses the Columbia River the river has cut sharply into the mountains leaving them highly eroded. The land forms exhibit strong influences on form, line, and color. This mountain chain rises abruptly terminating in a definite edge along a well defined ridge to the northwest. The south edge of the Saddle Mountains are less rugged and slope gently to the flat expanses of the Wahluke Slope.

The general landscape character of the southeast portion of the Wenatchee National Forest is mountainous. The rolling to angular hills, with numerous rock outcroppings are pleasing to the eye in form. Line is strongest on the skyline, followed by the ridges and shape of individual trees. In some areas horizontal rock layers (strata) are strongly evident in line, scale, color, texture and contrast. There is a high degree of contrast between the very fine textured slopes and the course, scattered conifers. The hills are generally covered with scattered timber, with patches of hardwoods in moist areas

and along creeks. Hardwoods and local brush species do land some color in the fall. Man made structures are primarily roads with some fences and an occasional cabin.

a. Major Theme

The dominant impression that the overall landscape gives to the visitor is one of endless miles of windy openness. The study area is quite vast in scale, and gives an impression of freedom to those who enjoy vast open expanses.

Those areas of high scenic value which are viewed from high use roads are rated Class II. Those areas which are low in scenic quality and viewed from low use roads are rated Class IV. Those areas in between are rated Class III. See Visual Resources Map II-12.

b. Harmonious Elements

Due to the open expanses of the study area, man made intrusions are easily seen in some instances. The orderly and pleasing arrangements of some land forms are disturbed by fences, roads, and power lines. In many cases these intrusions are quite notable in otherwise undisturbed areas.

c. Accentuating Elements

All land forms in the study area exhibit strong influences of form, line, color, and texture. Ridgetops and canyons form strong lines of contrast against the horizon or in the shadows formed by narrow eroded canyons. Where cultivated fields border uncultivated land strong contrasts are evident in line, form, color, and texture. Man made intrusions which stand out dramatically against the natural background are roads, power lines, mining activities, fences or structures, and vegetative manipulations. These intrusions become much more evident as one moves from background to foreground viewing especially in areas of high sensitivity.

2. Sociocultural Interests

a. Educational-Scientific

The lease application area contains many outstanding geological and paleontological features. These are the volcanic formations on the Wenatchee National Forest and thick basalt flows of the Columbia Basin, the glacial features including the channel scablands of Eastern Washington resulting from glacial floods, the riverine features created by the major rivers, and exposed paleontological and mineral deposits. Because they are unusual, fragile or outstanding examples of a geological-paleontological feature they have scientific and educational value.

The Yakima River Canyon exposes basalt cliffs and riverine features making it an outstanding example of a canyon or gorge and watergap. Yakima River Canyon also contains exposed deposits of petrified wood. The north slope of Manastash Ridge contains deposits of vertebrate fossils and petrified wood. Ginkgo State Park is an outstanding example of a petrified wood forest. Not only is the rare ginkgo tree found in petrified form, but there is also an exceptional variety of wood species.

Saddle Mountain contains an enormous amount of petrified wood. The wood deposits are found in the same geological formations as the wood at Ginkgo State Park and probably contain just as many varieties of petrified wood. Saddle Mountain has been modified by the glacial floods that scoured the Columbia Basin formulating the channeled scablands. Distinctive formations are Sentinel Gap, Smyrna Bench, and Crab Creek. Lower Crab Creek is also an outstanding example of sand dune formation and succession. The Rattlesnake Hills contain deposits of petrified wood. Diatomite beds are evident on the Saddle Mountains, Frenchman Hills and the Yakima River Canyon. Most of these deposits have been quarried to some extent.

Areas of a pristine nature containing examples of natural flora and fauna are rapidly being depleted. Rapid growth of human populations and alteration of the ecology, especially by expanding agriculture, make it necessary to set aside areas of suitable size and ecology, to preserve samples of these various species and habitats.

Preserving these areas as living museums for educational and scientific purposes gives scientists and educators a place to test the validity of new theories in natural communities.

There are areas containing some unusual plant and animal species, stands or communities within the study area which may deserve some special consideration.

The Priest Rapids Dam and Wanapum Dam reservoirs, located adjacent to or within the lease application areas, are protected under the Washington Shorelines Management Act of 1972.

All or portions of the following rivers and streams that meander through the lease application area are protected under the Washington Shorelines Management Act of 1972:

Columbia River	South Fork Manastash Creek
Yakima River	South Fork Cowiche Creek
Lower Crab Creek	Naches River
Manastash Creek	Tieton River
Tanuem Creek	Rattlesnake Creek

The Shorelines Management Act of 1972 regulates development within 200 feet of the shoreline or associated wet lands through a local permit system under state guidelines.

Before white men came to the area, the area was occupied by roving bands of Indians. The Indian lifestyle was nomadic and dependent on hunting and food gathering. The first white men were trappers and traders of the Hudson Bay Company. In 1852 Catholic missionaries settled in the Yakima Valley. From 1855 to 1859 Indian wars brought settlement of the area to a standstill. A treaty ratified in the 1850's ended the Indian wars and placed the Indians on reservations. Some of the tribes, such as those led by Chief Moses, were slower in accepting a reservation life style and never actually signed treaties.

The first white settlers were cattlemen. Cattle were driven to the gold camps in British Columbia and through the passes of the Cascade Mountains to Seattle. Livestock raising was the primary activity until the 1880's. The Catholic missionaries introduced agriculture and irrigation to the Indians as early as 1853 but it wasn't until the late 1860's and 1870's that white settlers began developing irrigation and a strong agricultural economy. The white

man's first travel routes reportedly were old Indian trails. The Naches Pass Trail was used as early as 1841 by the Wilkes Expedition. In 1853 the first wagon train through the area, the Longmire-Byles wagon train, followed the Yakima and Naches River through the area and crossed Naches Pass.

With the outbreak of Indian wars military forts and linking road systems were built. Settlers used these roads to gain access to the region and settle new towns. Roads were built between towns for trade and social life.

In the late 1880's and early 1890's three railroads were built that traversed the area. The railroads improved transportation and created a new market area for Eastern Washington. The agricultural and lumber industries prospered and settlers moved into the area. Development of the area was primarily agricultural in the early 1900's. After some failures in dry land farming, the agricultural industry began developing irrigation systems wherever possible. The lease application areas have continued to prosper upon its agriculture base.

The national and state registers of historic places were checked. No historic sites were found on either register that were adjacent to or within the lease application areas. There are four historic trails that traverse the lease application areas:

Naches Trail	Colockum Pass Trail
Old Durr Wagon Trail	Squaw Creek Road

There are historic sites on private land in the lease application areas that have not been evaluated for historic significance. Historic sites may exist on Federal land that have not been identified.

An extensive archeological inventory and library search of the lease application areas was made to supplement existing information. This was further supplemented by contact with local persons. The inventory findings are summarized in reports on file at Washington State University.

Previous archeological research has identified five cultural phases in the lease application area: Windust

(10,000±B.C.), Vantage (Cascade), Frenchman Springs (Tucannon), Cayuse (Harder) and the Ethnographic Patterns. The Ethnographic Pattern Phase begins with the Cayuse Phase and extends up to white (Euro-American) contact. At white contact the lease application area was inhabited by Salish speaking and Sahaptin speaking tribes.

Three archeologic physiographic regions were identified in the extensive survey of the lease application areas. The areas were occupied seasonally, dependent on the needs of the people. See map II-11 for the physiographic regions utilized.

Riverine	Upland	Cascade Foothills
Fishing	Root crops	(Same resource exploitation as uplands)
Mussels	Hunting and gathering	
Large Campsites	Mineral exploitation (stone for tools, pegment for paint)	Small campsites, cairns, quarries
	Small campsites, cairns, quarries	

The life style is generally characterized as a seasonal economic round for resource collection. Winters were spent along the rivers where it was warmer. Lodging consisted of semi-subterranean pit houses and mat lodges. Occasional hunts were made. In early spring the people were along the rivers fishing for salmon and suckers. Trips were made into the uplands for vegetable crops and to hunt. Late spring was the same with people returning to the rivers for additional salmon runs. When summer arrived everyone moved to the uplands to hunt and gather roots. The major salmon run came in late summer and everyone returned to the rivers. In the fall deer hunts were made in the Cascade foothills. The last of the roots were gathered and everyone moved back to the rivers to catch the last salmon runs, store foods and repair the lodges in preparation for winter.

Major trading activities usually took place in the fall along the rivers at favorite fishing stations. Within the survey area there is evidence of contact with the coastal tribes of Washington.

The three archeologic physiographic regions differ in site densities and recorded information:

Riverine - This zone or region has the highest site density recorded. Major dam building and relic hunting have destroyed numerous sites along the rivers; many are still intact.

Upland - This is, for the most part, an archeologically unknown region. Current surveys have recorded moderate site density in some areas of the region. The potential of the upland region is very high for providing new and different information.

Cascade Foothills - Archeological research in this region has been extremely limited. Very little is known about site density or locations. Existing surveys have recorded sites that indicate a high potential in this region.

The Ryegrass Archeological District, adjacent to the lease application area on Saddle Mountain is on the National Register of Historic Places.

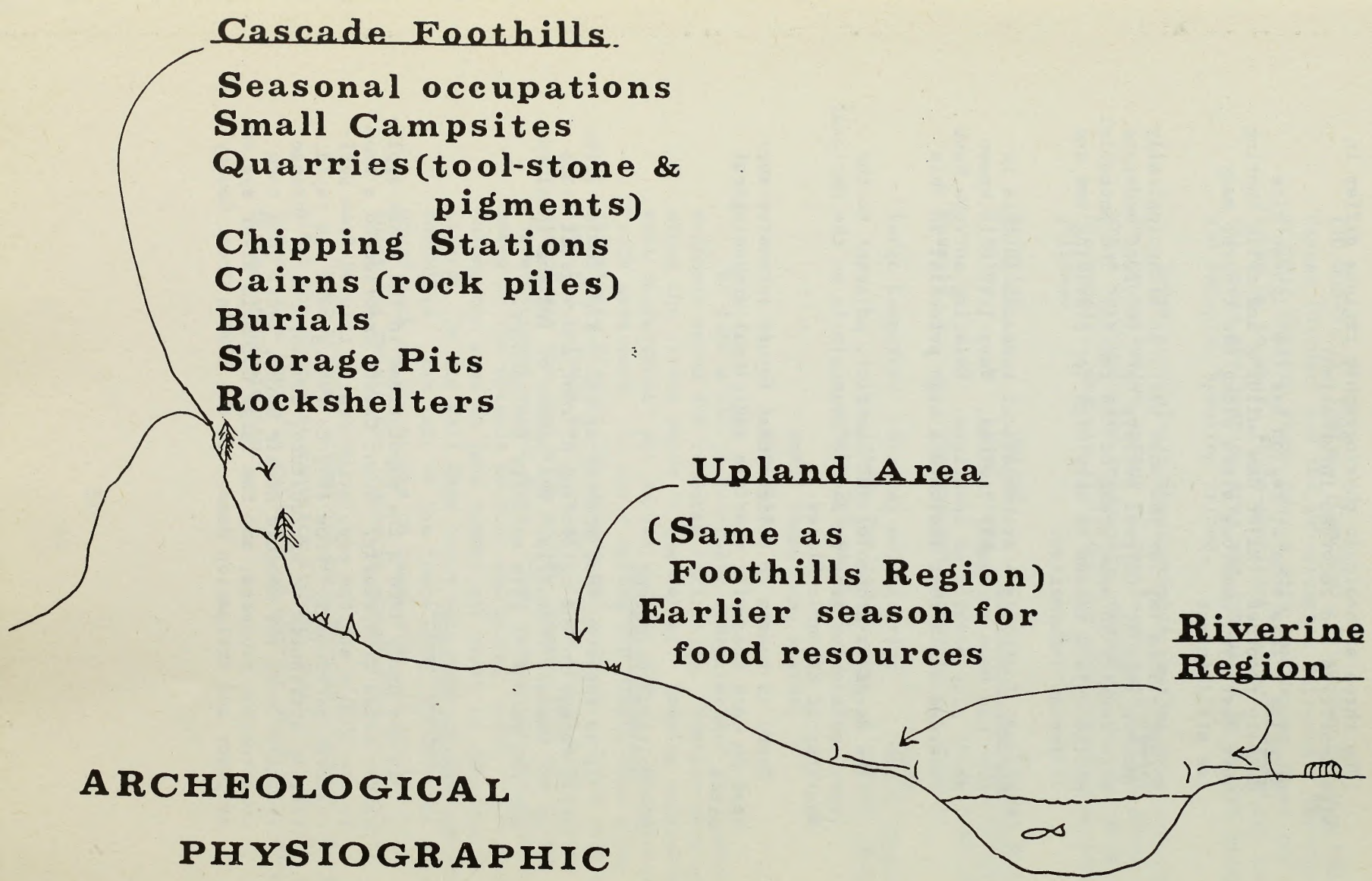
There is reason to believe that future intensive surveys in each area will disclose additional archeological sites.

b. Cultural Resources

It is reported that members of the Yakima Indian Tribe still engage in the collecting of root and vegetal crops in the Cascade Foothills. The number of Indians involved and the extent of this activity are unknown.

c. Social Welfare

In the early 1900's the populations in the lease application areas grew slowly. Grant County experienced a boom in the 1930's and the population nearly tripled from agricultural settlement. From 1940 to 1960 growth was rapid, largely attributed to agriculture, development of defense installations, the Hanford Atomic Works, local long term construction projects, and the large Columbia River system of power and irrigation dams. In the 1960's Grant County's



ARCHEOLOGICAL PHYSIOGRAPHIC REGIONS

MAP II-11

population decreased when defense installations closed.

The population of the lease application area has remained stable to slightly increasing in the 1970's. Population of the effected counties in 1974 was:

Benton	67,750	Kittitas	25,000
Grant	42,700	Yakima	145,000

The majority of the population resides in the rich agricultural and urbanized valleys. The growth trend has been away from the cities to the rural agricultural valleys. Population distribution of the lease application area varies from 16 to 25 people per square mile.

Minorities comprise between 8 and 14 percent of the total population. Ethnic groups residing in the area are Spanish, Negro, Indian and Asian.

Economic characteristics of employment in the lease application area are:

	1/ Number Employeed 1970-1971	Percentage
Agriculture, forestry, fisheries	13,480	18
Construction	3,900	5
Manufacturing	9,140	12
Transportation, communication, utilities	4,640	6
Trade	16,150	22
Finance, insurance, real estate	2,260	3
Services	17,090	23
Government	6,700	9
Other	1,870	2
TOTALS:	75,230	100

In recent years employment has become highest in services, closely followed by trade. Agriculture, forestry, and fisheries rank third followed by manufacturing. Transportation, communications, utilities and construction and government also provide significant amounts of employment. Agriculture and related industries are the primary sources

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1/ Figures don't include Benton County; 5% of the lease application acreage is in Benton County.

of income. Recreation, which is widespread throughout the economic base, is the second leading industry. Food processing is the largest single employer. Another important manufacturing category is lumber and wood products.

To date, oil and gas has had little economic impact upon the lease application area. There was a gas producing field on the east end of the Rattlesnake Hills. Commercial production commenced in 1929. This field supplied gas to seven lower Yakima Valley cities. Production ceased in September of 1941. El Paso gas developed a line into the lower Yakima Valley, and the Rattlesnake Hills field became uneconomical to operate.

The labor force fluctuates because of the seasonal nature of agricultural employment. Employment is highest from March to November with a slow period in June and July. There is no general shortage of laborers but there is a shortage of skilled employees for the technical, management and highly skilled professions.

Economic health of the lease application area has been dependent upon agriculture. The long range economic growth is projected to be: nonmanufacturing, agricultural, and manufacturing. New growth will be limited by the availability of raw materials. The agricultural and timber industries in Yakima and Kittitas Counties are mature with limited opportunities for expansion. Grant County can expand its agricultural base upon completion of the Columbia Basin Project; specifically the Bacon Siphon and Tunnel. Recreation and tourism can be expanded with additional development. To significantly expand the area's economic growth and provide additional jobs, the expansion must be industrial, according to the four counties development plans.

The median family income of the area is lower than the state average because of the types of industry and business. Compared to other counties in the state, Yakima and Kittitas Counties have the highest food stamp allotment, highest public assistance case load, and one of the highest rates of low income households.

The lease application area is a major exporter of agricultural crops, livestock and forest products. Additional domestic and foreign markets are needed. Adequate manufacturing firms are available to process the raw products for export. Expansion of agriculture would require additional

processing facilities. Tourism also provides an inflow of money to the area. Fuels needed for agriculture and manufacturing must be imported. Fuel shortages and rising costs could have a substantial effect upon the expansion of agriculture and industry. According to the Washington Water Power Company, approximately 70% of the natural gas consumed annually in the Pacific Northwest is imported from Canada under contracts that expire in the 1980's.

Social services in the lease application area are adequate but not evenly distributed. Services are concentrated in the urban areas. Educational opportunities are adequate in the public school systems, including colleges, and reinforced by parochial schools and vocational-technical training opportunities. The area is serviced by major interstate highways, railroads and limited air service. Auto-freight service is good but there is a shortage of short haul intrastate movement. Small communities have trouble obtaining commodities purchased outside the lease application area. Hospital facilities are adequate but not evenly distributed, resulting in a shortage of facilities and care in small towns in outlying areas. There is a drastic shortage of low income housing and the condition of existing low income housing is deteriorating. The economy of the area is dependent upon the availability of water. Seventy percent of the domestic water is from groundwater. Shallow wells are considered hazardous. Many outlying communities need to renovate and expand their domestic water supplies. Urban growth will require additional domestic water which will overburden existing transmission and distribution methods. Sewage collection systems and disposal plants in rural areas are sub-standard, and are predominately individual septic tanks. The counties have gone to sanitary landfills and closed existing dumps. Rural areas are long distances from the landfills. The counties have indicated a need of financing for rural refuse collection and transfer to centrally located landfill sites. Communication facilities are adequate. There are ample recreation resources in the area but there is a shortage of developed facilities for present and projected needs. The larger communities in the area have full time fire personnel. The remainder of the area is served by volunteer fire districts or unprotected.

d. Recreation

Within the lease application area are thousands of acres of publicly owned open space, recreation resources and privately

owned recreation resources that provide a wide spectrum of recreation opportunities. The warm, dry summer climate and winter snow combined with the variety of recreation resources attract thousands of recreationists each year. There are waterbodies, wildlife, spectacular mountains and desert scenery and collectible materials available in the area.

The Wenatchee National Forest provides year long recreation opportunities with many developed camping and picnicking facilities. The Columbia National Wildlife Refuge was established for migratory waterfowl. Recreation opportunities are wildlife oriented including hunting and fishing. Ginkgo State Park contains an exceptional variety of petrified woods including the ginkgo tree. The presence of ginkgo in petrified form and the diversity of woods has given the park national significance and qualified the site as a national natural landmark. Within and adjacent to the lease application area are six Washington State Game Wildlife-Recreation Areas (WRA's) The WRA's are managed for wildlife and wildlife related recreation.

The Yakima River Canyon with its combination of a free-flowing river winding through a canyon land of basalt cliffs has been designated as a State Scenic and Recreation Highway. Quartz Mountain, on the Wenatchee National Forest, is adjacent to the lease application areas west boundary, and has been given the forest service designation of a "Roadless Area". Recreation opportunities on Quartz Mountain are restricted to nonvehicle uses. There are four free-flowing rivers meandering through the area. These rivers provide miles of float boating opportunities. They are the Columbia, Naches, Tieton and Yakima Rivers. Portions of the Yakima River and that portion of the Columbia River from Priest Rapids Dam to McNary Dam pool are potential Wild and Scenic Rivers.

The Washington State Department of Natural Resources has developed approximately 160 acres as an ORV Area on Crab Creek north of Saddle Mountain. Rockhounds find substantial amounts of petrified wood on Saddle Mountain, Yakima Canyon, Rattlesnake Hills and other parts of the area. The Wenatchee National Forest and adjacent areas are popular for winter sports such as cross country skiing and snowmobiling.

Many proposed statewide trail corridors crisscross the area. Bicycle trail routes follow State Route 410 from

Chinook Pass to Yakima, U.S. 12 from White Pass to Yakima, and the Yakima River Canyon on S.R. 821 from Ellensburg to Yakima. On special occasions the Yakima Canyon River Road is closed to vehicular traffic except for bicycles. Foot and horse trails follow the Columbia River, traverse the Rattlesnake Hills, cross the Umtanum and Manastash Ridges west of the Yakima River Canyon between Ellensburg and Yakima and follow Umtanum and Manastash Ridges from the Yakima River Canyon west to the Wenatchee National Forest and Chinook Pass. The Columbia River and Yakima River have been identified as water trail corridors. ORV trails have been identified on Saddle Mountain, Rattlesnake Hills, the Manastash-Umtanum Ridge area west of Yakima River Canyon and the Wenatchee National Forest-Colockum WRA area north of Ellensburg to the Vantage Bridge. Grant County and Yakima County have also identified the Saddle Mountains and Rattlesnake Hills in their all-terrain vehicle plans.

The Washington Statewide Comprehensive Outdoor Recreation and Open Space Plan estimated that the recreation use by priority of demand, in the effected counties in 1970 was:

Activity	1/ Visits
Sightseeing and Driving for Pleasure	1,902,300
Bicycling	1,735,400
Horseback Riding	566,700
Fishing	550,900
Picnicking	413,700
Watersports	241,400
Camping	212,800
Hunting	208,300
Wintersports	195,700
Biking	64,000
Rockhounding	37,700

County plans indicate that the recreation resources can meet the present demands. According to the Columbia River Basin Commission, total recreation demand is projected to almost triple in the Yakima River Sub-Region by year 2000. While it is predicted that the recreation resources can accommodate present and even future demands, the necessity for facilities will become more acute. A better distribution of use is needed. While the resources in some areas

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1/ A visit is participation by one person in one activity or one area type for all or part of one day. Visits for Benton County were not added because of the small acreage involved and absence of developed facilities.

are highly developed and overused, other areas are underdeveloped and underused.

e. Attitudes and Expectations

The general consensus is the need for comprehensive land use planning to develop a diversified economy that will expand business and bring more industry. Equally important is protection of the natural resource base from abuse and ultimate depletion. History of the area shows that public sentiment is favorable to regional development.

Elaborate water delivery systems have been developed to irrigate thousands of acres of agricultural lands. Localized industry has been developed to process raw resources. In 1976 federal funding was obtained to complete the Bacon Siphon and Tunnel project of the Columbia Basin Irrigation Project. The public was favorable to development of the Hanford Atomic Works to supply economical power to attract industry to the area. A public hearing on the Arctic Gas Pipeline was held in Spokane, Washington in 1975. Statements made by the public indicated that they did not object to the pipeline and recognized the need for energy development but they wanted the impacts upon the environment to be minimal.

Local newspapers indicated they have not received adverse statements towards the proposed oil and gas leasing. Most of the private land within the lease application area have already been leased to oil companies for exploration and development purposes.

Local pressures against oil and gas leasing could foreseeably develop where private individuals own the surface rights and the U.S. retained the mineral rights. Development of the oil and gas resources could change the life style and present land uses of the surface owners.

There seems to be a general air of pessimism in the lease application area relative to locating an oil or gas field in economic quantities (see Section G).

Inquiries were mailed to landowners affected by the proposed leases, other federal, state and local government agencies and interested groups. Of the 192 letters mailed,

there were 23 answers. The letters received generally do not object to issuing the oil and gas leases but were concerned about the environmental impacts and remedial actions that would be taken.

f. Local Regulatory Structures

Benton, Grant, Kittitas and Yakima Counties are governed by a Board of County Commissioners. Each county has a planning department and has been zoned for land use. Comprehensive land use plans have been prepared.

The proposed leased areas in Benton County are zoned "unclassified", all land uses are permitted. Trades and industries must obtain building and land use permits. Proposed lease areas in Grant County are zoned "Agricultural" and in Yakima and Kittitas Counties are zoned "Agricultural" or "Forest-Watershed". The urban areas and agricultural valleys have a multitude of zoning classifications. Additional zoning information is available from the respective county planning departments.

The zoning designations do not restrict exploration for oil and gas.

Before drilling commences a special property use permit is required by Kittitas and Yakima Counties. Grant County requires a conditional use permit. These permits are obtained from the County Board of Commissioners, in all cases. The zoning classification of the land is not changed as a result of the permit.

"The Oil and Gas Conservation Act, Chapter 146, Laws of 1951" requires a drilling permit be obtained from the Washington State Department of Natural Resources at Olympia, Washington prior to commencement of drilling. The required state forms and permits are included in the appendix.

There are lease application areas adjacent to or within areas administered by the following federal and state agencies:

Federal:

Department of Defense - U.S. Army, Yakima Firing Center
U.S. Forest Service - Wenatchee National Forest
Bureau of Reclamation - Columbia Basin Project
U.S. Fish and Wildlife Service - Columbia National Wildlife Refuge

State:

Washington State Game Department
    Oak Creek, L. T. Murray, Colockum, Desert Potholes,
    Crab Creek and Wahluke Wildlife-Recreation Areas
Washington State Parks and Recreation Commission
    Ginkgo State Park
Washington State Department of National Resources

Other state agencies that administer programs affected by oil and gas leasing are:

Washington Department of Ecology
Washington Department of Commerce and Economic Development

OIL & GAS LEASE APPLICATION MAP

Visual Resources

Class II - High Scenic Value Area
Class III - Intermediate Scenic Area
Class IV - Low Scenic Value Area
S/S - Seldom Seen Areas

(See page 127 for details of class ratings)

Wenatchee Nat. Forest Unit

Yakima Canyon

Frenchman Hills

Saddle Mts.

Rattlesnake Hills

HANFORD WORKS (AEC)

MANASTASH RIDGE

UMTANUM RIDGE

OTTER CREEK

TOPPENISH RIDGE

CLASS II
CLASS III
CLASS IV
S/S

LEGEND

LOS ANGELES
OMAHA
GALVESTON
Laramie
Grand Coulee

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

LOCATION DIAGRAM FOR NL 11-4

LANDS UNDER LEASE APPLICATION AS OF Feb. 28 1976

SECTIONIZED TOWNSHIP

INTERIOR-GEOLOGICAL SURVEY WASHINGTON D.C.-41884

OIL & GAS LEASE APPLICATION MAP II-12
Visual Resources

BUREAU OF LAND MANAGEMENT
SPOKANE DISTRICT OFFICE
SPOKANE, WA. 99201

III. Analysis of the Proposed Action and Alternatives

A. Analysis of Proposed Action and Alternatives

The proposed action is the leasing of NRL private and state lands on which the United States retained the mineral rights, and other federally controlled lands, within the State of Washington, for exploration and development of the crude oil or natural gas deposits that may be located beneath or adjacent to these lands.

The alternatives identified are (1) the prohibition of surface disturbance or occupancy on specific tracts and (2) disapproval for leasing on all or specific tracts.

(1) Prohibiting Surface Disturbance or Occupancy on Specific Tracts

On some areas, it may be appropriate to consider the alternative of prohibiting disturbance or occupancy of the surface by drilling rigs and other facilities or activities associated with oil and gas exploration and development. Examples of such areas include streamside buffer strips, scenic corridors, recreation sites, steep slopes, and other tracts where surface disturbance or occupancy would result in undue adverse environmental impacts.

Surface disturbance or occupancy may be precluded by one of two means:

a. The tract may be withheld from leasing.

b. The tract may be leased but with the stipulation that no surface disturbance of occupancy is authorized. In such cases, oil and gas on the tract may be explored for and developed by drainage or directional drilling from sites outside the tract. With current technology and in areas with suitable geology, a well can be drilled one foot horizontally for every two feet drilled vertically. Thus, if wells are drilled one mile deep, the center of a tract one mile wide can be reached from a drill site on the edge of an adjoining tract. The possibility of the need to reject specific tracts is discussed in the pertinent sections of the "Impacts and Mitigating Measures".

(2) Disapproval of Leasing on All or Specific Tracts

A decision not to issue additional oil and gas leases would insure that oil and gas exploration and development

would not occur on the Federal lands in the area. It is possible that exploration activities would not be carried out on Federal lands even if the leasing program were continued.

Regardless of whether additional Federal lands were leased in the area, exploration and development is occuring on adjacent lands. If oil and gas were discovered on intermingled lands, the ensuing development would create a demand for roads and pipelines across adjacent Federal lands.

In areas where a significant portion of the land is Federal, withholding Federal leases might discourage exploration of adjacent private lands because of inability of the applicant to block a proposed exploration area.

Many of the private land owners, who also own mineral rights, have reportedly signed leases with oil companies for exploration and development for oil on their property. Before oil or gas wells would be drilled on either state, Federal or private land, a permit must be obtained from the Oil and Gas Conservation Committee of the Washington State DNR. See Appendix for copies of State of Washington forms to be used.

Since there are no proven oil and gas reserves in Washington, a decision to withhold additional Federal lands from leasing might not have an obvious and immediate effect on the nation's energy supply and demand relationships. Past drilling in the state has produced indications of oil and gas; the possibility remains that Federal leasing could lead to commercial discoveries. To some extent, therefore, a decision not to lease Federal lands in the area could increase the nation's reliance on efforts to reduce energy demand and produce energy from other sources.

A decision not to lease would tend to preserve the unique character of some of the areas such as the Yakima River Canyon. This decision would likely aid in the conservation of natural resources such as fish and wildlife. A decision not to lease would be favored by those individuals that have moved to the area to enjoy the remote "unspoiled" atmosphere of much of the basin area. The following portions of this report deal with impacts that are expected to occur during the proposed action's four stages of implementation and their related discrete operations.

The stages of implementation, also called "phases" of implementation have been identified as (1) exploration, (2) development, (3) operation and (4) close-out.

B. Anticipated Impacts

1. Nonliving Components

The discussion of anticipated impacts may touch on possibilities of what could happen if proper practices and procedures were not followed in the proposed oil and gas operations. It should be pointed out that if oil and gas operations are allowed by the issuance of permits under existing laws and regulations, many of the possible impacts would be precluded.

a. Air

Exploration is believed to be a phase that should have insignificant overall adverse impact on the air quality of the areas where the subject lands are located. Air movement patterns and temperatures should not be affected by any of the identified discrete operations. Exploration work should not create any significant non-ionizing radiation problems since no major power sources would be developed. All generator usage would be localized and power would be by either diesel or gas motors. Communication would be limited to possible utilization of small units such as citizen band radios, radiotelephones, and walkie-talkies. No problems are anticipated as to reception or local interference.

The most significant adverse impacts affecting the air quality would be the particulate matter created by soil disturbance and noxious gases caused by emissions from internal combustion engines. These engines would power various vehicles, equipment and also be used in the initial exploratory drilling operations. All of the subject lands are situated in areas that have fairly high velocity prevailing winds from the south, southwest or due west. This would cause any loose, finely textured particulate matter to become airborne. The overall impacts would not be too severe since the majority of lands have fairly coarse textured soils which would not be subject to air suspension. The exhaust fumes from motorized vehicles, pump and generator motors would not have a significant adverse impact on the overall air quality. The prevailing winds would tend to dissipate and disperse any noxious gases while cleansing the air. Also, the work done during this phase would not be centralized so particulate matter and fumes would have an excellent chance to disperse. It is probable that the existing road system will be sufficient to handle the needs during exploration.

The development phase has the potential for having the major significant adverse impact on the air quality of the areas, since it is basically construction activity. This phase would include discrete operations, such as road and facility construction, as well as development of the actual drill sites that would be used in the operation phase. The road construction would be more intense than that of the exploration phase since the developed ingress and egress roads should be of good quality. This would necessitate the usage of some large earth moving and compaction equipment. The activity would create additional particulate matter as well as noxious gases from vehicle emissions. The overall potential impact is believed to be from low to moderate in intensity since all "semi-permanent" road construction would be of a short duration, probably measured in weeks. The prevailing winds will dissipate particulate matter and fumes before dispersing them. The same is true for rehabilitation work.

The intensity of the impacts anticipated during the drill site development and facility construction discrete operations, is also believed to range from low to moderate. All of this activity would be completed within a period of from 1 to 3 months and the initial efforts would be the most critical stages. Any building activity would also create some particulate matter and noxious gases. The prevailing winds and fairly short duration of the operations would help to mitigate the recognized adverse impacts.

Air movement patterns and climatic temperatures would not be adversely affected. The vertical structures to be built would be basically either towers or low profile buildings. Natural wind flow interference would be minimal. Non-ionizing radiation problems would not be expected to occur in any significant magnitude, although many of the tracts are in close proximity to existing power sources. Any power lines that would be strung during this phase would not be operational until the operation phase is underway.

The operation phase pertains to the production and maintenance period. The facility would be operational and producing. This phase would not have a significant adverse impact on air movement patterns or temperatures. The tower platform structures are not solid; air could pass by and be slightly diverted. There is a possibility that some non-ionizing radiation could occur if the applicants decide to

bring in and use electrical distribution lines instead of diesel motors. This non-ionizing radiation impact could affect various communication site facilities situated on some of the higher peaks in the areas. The overall potential impact is believed to be low. This assumption is based on the fact that Bonneville Power Administration and other large utility companies have several high voltage transmission lines extending through the areas and there are no indications of any serious interference problems. Some new lines might be built nearer the existing facilities, a situation that could create problems. The voltage would be low compared to that of the larger lines already in existence.

Particulate matter and noxious gases could have a slight adverse impact on the air quality. The utilization of new drill sites would probably have a moderate impact. Waste disposal would not be too adverse to the existing air quality. It is assumed that burning, except for experimental flaring, would not be allowed. The impacts anticipated during any maintenance work are unknown. None of the impacts would be more severe than those expected to occur during the development phase.

The adverse impact potential for the close-out phase would be similar to those identified for the other phases. Air movement patterns, temperatures and non-ionizing radiation would not be significant problem areas. The particulate matter and noxious gases that would become airborne would be dissipated and dispersed by prevailing winds. The return of administrative responsibility from USGS to the BLM is strictly an administrative process which would not affect the air quality or physical environment.

b. Land

Exploration would have a slight to moderate effect on the effected land. Airborne exploration would have no impact. Off-road vehicle travel would impact the soil structure and contribute to future erosion. This discrete operation would not have a significant impact on the geologic structure or land use compatibility. Soil pollutant properties caused by leakage of oil or gas from vehicles might occur; the impact would be so minor that it will not be discussed further.

Road and trail construction also necessitates the usage of vehicles and some large earth moving equipment. This would affect soil structure which in turn could create

erosion problems. The vehicles could leave ruts where they travel. It would be necessary to use tractors or graders in order to establish the preliminary road system. Geologic structure would not be adversely affected since it is considered to be quite stable at present and able to support any of the road building equipment which would be brought into the area. Soil pollutant properties would be minor, resulting from leakage in the fuel systems of the various vehicles. It is assumed that the operators would keep their vehicles in good working order so pollutants would not pose a significant problem.

Drilling would also contribute to soil erosion and affect the present soil structure. The impacts would range from low to moderate in intensity. Drilling would have no known impaction on the geologic structure. The same is true for possible soil pollutant properties. Land use compatibility would not be adversely affected to any great degree. Small acreages may be diverted from their present uses. Rehabilitation work would prove beneficial to the soils as far as erosion is concerned. This discrete operation would also prove mildly beneficial to the compatability of total land usage.

In summary, some adverse impacts would occur. These impacts could vary from slight to severe. The existing soils and underlying geologic structures are believed to be able to adequately support the proposed exploration activity. No appreciable subsidence would be expected due to the thick mantle of basalt throughout the lease application area. The impacts would be minimal due to the short duration of the exploration phase.

In the development phase the road and trail construction would consist of improving the existing road systems plus any roads built during the exploration phase. Compaction of roads would have adverse impact on the soil structure. The roads would be bladed and gravelled and slight erosion would be probable. The potential erosion impacts are believed to be low since the roads would likely be surfaced. Geologic structure would not be affected since the underlying formations for all of the subject areas are sound. The road construction activity and completed projects would be reasonably compatible to existing land uses.

Plant construction would create some problems in soil structure and erosion categories. These impacts would occur during the initial ground breaking when foundations are erected. The same is true for additional drill site developments. Neither of these discrete operations would

have a significant impact, adverse or beneficial, on geologic structures, or create any major soil pollutant problems.

Any rehabilitation work would have a minor beneficial impact on the land. It is assumed that the soil structure and erosion problems identified previously would be somewhat abated after rehabilitation has been completed.

The operation phase would have a minor additional impact on the land that would be actually used in the various projects as well as the surrounding properties. New drill sites would disturb the existing soil structure and create some erosion problems. The existing soil is fairly stable for all of the proposed sites. This discrete operation is considered similar to that which would be experienced during the development phase. Geologic structure would not be significantly affected. Minor soil pollutant problems would be probable.

Maintenance of the existing facilities should not pose any major problems for the land. Some vehicular activity would be needed in order to transport men and equipment during this discrete operation. It is assumed that existing road systems would be followed where available. Waste disposal would have minor impacts on the land. The same is true for geologic structure and compatibility of land uses. The actual production works might contribute somewhat to soil erosion and disturb the structure to a minor degree; the overall impacts should be low. Impacts anticipated during drilling operations which may affect the geologic structure or create soil pollutant properties are unknown. Analysis of operations affecting similar lands shows that impacts would be minimal.

The close-out phase should be similar to the development phase. The structures erected and other improvements would be shut-down and removed. The removal operation probably would contribute somewhat to soil erosion and have minor effects on the soil structure. These impacts would not be too severe since the existing soil structure is quite stable and the entire operation should be completed within a matter of a few months. Roads would remain to be used if needed; if not they would likely be abandoned. The land taken out of use by roads will likely remain out of use in the foreseeable future. No significant adverse or

beneficial impacts would occur as to geologic structure and land use compatibility. Removal of structures, equipment and other improvements would not create any significant soil contamination problems unless some major seepage occurs, which is highly unlikely.

The capping of the drill holes and wells should have no impact on the land. The holes would already be there and the capping would merely be an incidental operation. The surface reclamation and restoration would initially create some minor adverse impacts, but these would be of a short duration. The overall potential impact of this operation is considered to be moderately beneficial. The transfer of administrative responsibility of the land from USGS to BLM is a clerical action that would have no impact on the quality of the lands.

c. Water

The term "water" refers to both the surface and sub-surface (groundwater) resource. As shown on the lease application map, many of the pending oil and gas lease applications border on or are in close proximity to various running rivers, streams and creeks. Generally speaking, all of the potential sites situated on the lowlands are in areas where the ground water table is fairly shallow, generally within 300 feet of the surface.

An anticipated impact to water quality during the exploration phase would be an increase in the sediment load during the discrete operations of off-road vehicle travel and preliminary road and trail construction. The various off-road vehicles would undoubtedly ford any small streams which could create sediment deposits.

Past indications of preliminary road building techniques shows that these roads are somewhat hastily constructed by blade equipped vehicles. These vehicles destroy natural vegetation in their path and could create or contribute to sediment load on rivers, streams or lake beds. The impacts associated with preliminary drilling operations also have the potential to contribute to sediment deposits. Unless properly located the drilling could leave mud pits on sites which could slide into water bodies during rainy periods unless properly located. Any caustic elements contained in this fine mud could contaminate the stream and sub-surface water. Drilling into or through underground aquifers

creates the possibility of releasing drilling contaminants into the aquifer, or losing the aquifer to other substrata. The impacts could be minor since drill holes would be fairly small and the drill bits would not disturb too much natural sediment material.

Rehabilitation work could also contribute to the sediment load for surface water. The activity could occur in proximity to surface water bodies which would disturb loose soil on the banks. The sediment deposits that could occur during any one of these discrete operations are not believed to be in sufficient quantities to divert the natural flow of waters or create any significant channel erosion.

The development of an oil or gas field could necessitate the improvement of the preliminary road system. This discrete operation would have similar impacts on surface waters as were associated with the previous exploratory phase. The intensity of impacts would be low since this operation deals more with compaction and surfacing as opposed to initial blading and soil disturbance. Sedimentation and disruption of the hydrologic cycle are considered to be the problem areas.

Development of drill sites could also contribute additional sediment. This discrete operation necessitates the laying of oil and gas pipelines to storage facilities, as well as drill pads in wetter areas or near water sources. Some provision would have to be made for sewage disposal since the crews that would construct the drill sites and processing plants are believed to involve a considerable number of people. Unless proper regulatory control means are used, sewage effluents could find their way into streams and even contaminate ground water.

Plant construction could also affect the sediment load and disrupt the hydrologic cycle if the projects are situated near water areas. The impact that any needed rehabilitation work would have is believed to be low. The effects of rehabilitation depend on the location of the activity as well as proximity to water. The drill sites could have a minor impact on ground water since the casing of drill holes could create sediment. Various toxic chemicals and other undesirable substances could be introduced.

The operation phase, when the resources are removed, handled, stored and transported, would cause additional water

quality impacts. New drill sites could cause basically the same problems that would be encountered during the development phase. These include some minor sedimentation and possible dissolved solids and toxic chemical problems.

The maintenance of existing facilities would have little or no impact on water resources. This discrete operation would consist basically of repair and construction of structural facilities and equipment. This operational phase would have the potential for causing significant contamination problems if not handled properly.

The actual production operation would have the same potential. Corrosion could occur in the well and drill hole casings. Oil seepage from pipes, conductor lines and storage facilities is always possible. If some contamination agents find their way into either surface or ground water sources, extensive impacts could occur. The effects of this contamination might not be known for some time if the ground water pumping station is situated a long distance from the oil field.

The close out stage also has discrete operations that may affect the water resources. The removal of above ground facilities and equipment could adversely affect live water sources. The capping of the drill holes and wells could have a detrimental impact on the ground water. The casings could still remain in the ground and would be subject to rust and corrosion. This situation could cause seepage of toxic chemicals and residue acids into ground water reservoirs. The surface reclamation and restoration could contribute sediments to surface water. The transfer of administration should have no impact on water resources.

2. Living Components

a. Plants (Aquatic)

All phases of oil and gas operations can adversely affect aquatic vegetation. The proposed exploration and development phases and road construction could destroy aquatic vegetation at stream crossings. Earth slides triggered by road construction might enter river and stream channels and destroy riparian vegetation and bury downstream vegetation under sediment and debris. Some sedimentation could have short

term benefits to aquatic plants in developing ecosystems. In most cases excessive sedimentation is detrimental because it reduces the quality and amount of aquatic habitat.

Aquatic vegetation could suffer impacts from exploratory and development actions that disrupt or eliminate ground water. Drilling of wells could alter ground water hydrology thereby reducing aquifer flows. Well drilling requires large amounts of water which may be piped several miles from a river, stream or spring to the drill site. Reduction or elimination of the water in a stream or spring would adversely effect aquatic plants living in them.

Destruction of aquatic vegetation could occur from accidental spills and well blowouts during exploration and development phases. Drilling mud, oil, gas, briny water and toxic substances could enter surface or sub-surface water. Fires started by blowouts could burn riparian vegetation. Impacts on aquatic vegetation resulting from oil and drilling mud contamination could become more serious during any production phase as a result of pipeline leaks in the gathering system and transportation lines; spills, leaks and equipment failures while handling and storing extracted oil; defective separators and evaporation pits.

During and after abandonment of a field, oil as well as saline water originating from improperly capped wells or breached mud pits could kill aquatic vegetation.

Removal of any oil and gas operation would eventually allow the aquatic plant community to restore itself to it's original state.

b. Plants (Terrestrial)

Impacts on terrestrial vegetation during the proposed exploration phase could occur as a result of surface clearing operations essential to such activities as seismic surveying, stratigraphic testing and wildcat drilling and exposure of vegetation to fire, oil, briny water and toxic gases such as hydrogen sulfide. Off-road vehicle use, road construction and building drill pads could eliminate vegetation from localized sites.

During exploration, soil compaction associated with the use of heavy machinery could reduce vegetative growth due to the physical restriction of root growth, reduction of available water for plant growth and reduced water infiltration and permeability.

Site productivity could be reduced on cutbacks and sidecast material where soil humus has been removed or covered by sterile soils from lower horizons.

Exposure to oil or briny water as a result of spills, blowouts, or contamination of underground water zones as toxic liquids rise in wells or test holes could kill terrestrial vegetation. A similar situation might exist in mud pits where leaks, breaks or overflow could cause vegetative kill or reduction in vegetative growth.

Air pollution as a result of emissions of hydrogen sulfide and other pollutants from tests drilling and wells could injure or completely kill terrestrial vegetation.

Fire from blowouts would be an obvious threat to terrestrial vegetation. Dry vegetation could be ignited by equipment as well as the careless smoker.

The proposed development phase would generally constitute a period of increased activity in a concentrated area. Impacts described for exploration would occur in this smaller area but to a greater degree. Additional activity during development, including road, pipeline and facility construction, as well as production well drilling might also mean increased damage to vegetation. Installation of oil storage and transport facilities, pressure maintenance systems, secondary and tertiary recovery systems, communications systems, disposal facilities and operation and maintenance site construction would add to vegetative destruction.

Greatest potential impacts during the proposed production phase would most likely be associated with exposure of terrestrial vegetation to oil, brine and toxic gases due to continued drilling of wells, and disposal of brine especially if evaporation pits are used. These pits would tend to leak or break and could overflow.

The proposed abandonment phase could also cause destruction of vegetation and reduced productivity of the land as a result of exposure to any residual toxic elements released through the deterioration of facilities left on the site.

These include pipelines, mud pits, dikes, storage tanks, or reservoirs and sumps. Also, abandoned drill pads, roads, airstrips, and campsites would be nonproduction sites for many years where concrete or asphalt is used for surfacing. Many nonsurfaced areas could also remain unproductive due to severe soil compaction from use of heavy machinery.

Rehabilitation actions would have a positive impact on vegetative environment.

c. Animals (Aquatic)

Aquatic animals are influenced greatly by activities which occur beyond the water edge. Building access roads and clearing for building sites might affect any nearby live streams through siltation or chemical degradation. Areas that are especially sensitive to erosion are steep cut banks adjacent to streams and in gullies.

Possibly the two greatest potential impacts to the environment would be the uncontrolled flow of water and wildlife. Fire might remove streamside and hillside vegetation, thereby causing the degradation of water quality and reducing the available food supply for the local animals.

Increased sediment in water is very damaging to both the aquatic plants and animals. Suspended sediment reduced the amount of light penetration; therefore, the rate of plant growth is retarded which in turn reduces the amount of food supply to various animals. A higher sediment load directly effects the gills of fish and may cause death.

Sediments also fill gravel beds in streams, which reduces the productivity of salmon and trout populations. The eggs become covered with silt and suffer increased mortality. When sedimentation is heavy, fry are unable to escape from between the rocks. Heavy sedimentation could also smother aquatic invertebrates.

Direct removal of gravel from stream beds would destroy spawning areas of various fish and the habitat for other aquatic animals.

Accidents connected with drilling which could contribute to degrading water might be: blowouts, spills or leaks

of oil, gas, and escaping of hydrogen sulfide, drilling mud with its contaminates, and possible increase of water temperature. Temperature increases or changes in pH due to organic wastes or introduced chemicals can become intolerable to some species.

Crude oil and its by-products are very toxic to fish and other living organisms. Respiration of fish is effected. If the fish do not die, contaminated food organisms eaten by fish cause an objectionable flavor to the meat if eaten.

d. Animals (Terrestrial)

Many of the same problems which could occur to aquatic animals are present and would in effect be problems for terrestrial wildlife and domestic livestock.

Road development would provide easier access. There is an increased chance that wildlife might be harassed during critical periods in their life cycle and poaching could increase. Roads, pipelines and equipment could interfere with wildlife and livestock movement.

Certain precautions in road construction would be necessary in order to keep erosion to a minimum. If soil is disturbed, reseeding projects would follow to re-establish protective vegetative cover and reduce erosion to a minimum.

The loss of big game winter range could increase the depredation of game animals such as deer, elk and bighorn sheep. The loss of favorable nesting sites on such game birds as the sage grouse could eliminate whole populations of isolated groups from an area. Sagebrush removal would impact the sage grouse due to its selective food habits and dependence upon the sagebrush vegetative cover type.

Airborn exploration normally would cause little impact. Continued flights at low elevations occurring over lakes during the winter migrations of waterfowl or over areas of high raptor nesting, could cause stress situations to occur.

Construction activities would remove additional habitat from wildlife use because of buildings and equipment taking up space. Human activity might force some species to move out and away from their usual habitat, often times into marginal habitat.

Water is in short supply over sizeable areas and extensive use of this water could have considerable impact on aquatic plants and animals in all life zones represented. When water tables are lowered or when water is drawn directly from lakes at a rate greater than that being replenished, the vegetation would change. Shore birds are largely dependent on vegetable matter for forage and would have to seek new locations if their water sources dried up. This change could be reflected in a downward trend in waterfowl use and production.

If new water sources were developed in the process of oil development they could be developed and made available to animals.

The construction of buildings and human activity near water could disturb animals at their normal watering sites.

Holding ponds, mud pits, or spills caused by blowouts could be potential accident hazards to wildlife and livestock.

The removal of vegetative cover could destroy the habitat of small mammals, amphibians and reptiles who have an important place in the food chain of predators.

The construction of towers or power lines could result in an increase of accidents to birds. They might also provide resting and nesting sites.

Housing development at locations near production sites could contribute to pollution in the soil and contaminate the ground waters.

Rehabilitation could restore some of the values lost because of the activities associated with oil and gas leasing but considerable time would elapse and some areas might never recover to their original vegetative type or support the former wildlife species.

Some areas might become more productive for animals due to better access, more available water, and more available forage.

Impacts on wildlife would be temporary during site abandonment activities.

3. Ecological Interrelationships

Unmitigated environmental impacts of the various discrete operations associated with oil and gas leasing are discussed individually in subsequent parts of this section. This section will deal collectively with the potential overall impact of the program on the total environment and its living components.

Oil and gas operations which alter any of the nonliving or living components of an ecosystem have potential for adversely affecting ecological interrelationships. It is assumed that impacts on one part of the ecosystem would somehow affect the whole.

a. Plant Succession

Removal of vegetative cover incidental to construction of trails, access roads and drilling sites would alter plant succession. A complete return to the original vegetative climax community might never be achieved on sites where the surface soils have been removed or substantially altered. This is because the soils contain the basic elements and nutrients essential to the functioning of the terrestrial plant communities. On areas where the soil has not been altered and only the vegetative cover removed, a long term interruption of plant succession could be expected because of the dryness of the sites and the low productivity of many plant communities.

b. Food and Community Relationships

Soil disturbance caused by road construction and drilling operations affect the food and community relationships. The soil is the habitat of the decomposers and contains the basic elements and nutrients essential to the functioning of the plant communities. Soil is the medium in which the nutrient cycle begins. In severe disturbance to the soil, the vital processes of the plants cannot be completed. Soil is the matrix in which root systems both anchor the plant community and serve as conductors for the movement of moisture and nutrients.

The soil might be polluted by spilled petroleum or other chemicals during exploration or drill site operation. There might be a complete cessation, or significant reduction, in the activity of the decomposer organism or plant community because of the elimination or decrease of the decomposer populations or plant communities.

Soil compaction is a factor particularly in the Yakima River and Rattlesnake Hills Area. Heavy equipment might compact the soil's pore space so as to impair its permeability and water-holding capacity. This in turn could inhibit nutrient cycling and reduce the vigor of the dependent plant community.

Landslides or earth movement might occur as a result of poorly conceived operations where excavation is done on steep or unstable terrain.

Sedimentation and pollution of natural waters resulting from certain oil and gas operations could kill aquatic micro organisms, vertebrates and aquatic vegetation, or inhibit the capacity of the aquatic biota to reproduce and maintain itself.

Terrestrial birds and mammals partially dependent upon natural waters, as well as aquatic and amphibian life forms, might also be adversely affected by degradation of water quality. Certain animals, at the culmination of short food chains, might be eliminated first, even when general concentrations of pollutants are very low. Eventually the habitat might be sterilized.

Emissions of toxic gases during any phase of oil and gas operations could cause local destruction of vegetation. Air-borne substances have been shown to inhibit photosynthesis and plant growth. The adverse effect of atmospheric pollution on human and animal health could be significant.

Harassment by man's operations, or loss of food supply and cover, might cause animal species to emigrate from one habitat to another. The loss of these use areas, critical for a species to complete its life cycle, would obviously be detrimental to that species. The impact on the resident species by the newly arrived species could be detrimental.

The natural balance of the ecosystem has been disrupted by several land uses such as agriculture, fire, subdividing, grazing, recreational and industrial uses. Additional impairment of this interrelationship by gas and oil operation could significantly increase the present imbalance.

4. Human Interest Values

a. Landscape Character

During exploration and development, new roads and trails would add lines of contrast to landscape features. Disturbances of the soil or vegetation would easily be seen for great distances, especially when intrusions are large in scale, and alterations in form, line, color, and texture are noticeable.

The higher the standard of roads into the drilling sites, the longer the impact would be visible and the harder it would be to restore and revegetate. Many of the new roads would be seen from some high use roads.

Drill rigs would be a temporary intrusion on the landscape and would be removed when drill holes have been completed. Well heads, pumps, tanks, pipelines and power lines would become long-term intrusions upon the natural landscape features in these areas.

The close-out phase of gas and oil development should remove or camouflage above ground inharmonious features from all landscape regions.

b. Sociocultural Interests

The natural appearance of geologic and paleontological features could be altered or destroyed by changing their distinctive structural form, altering or obliterating evidence of the natural forces that created the geologic structure, changing its extent, or by altering its visibility. Road construction could undermine features changing their natural progression, materials cast aside might cover features and roads might bisect features altering their visual appearance. Erosion initiated

by road construction and seismic grid trails might alter features. Seismic testing with explosives, thumpers or vibrators might collapse fragile geologic formations. Road construction and sampling with backhoes or bulldozer might uncover and disturb petrified wood and fossil deposits. Once uncovered the materials could quickly be depleted by collectors. Structures placed in the proximity of geological and paleontological values would distract from their visual appearance. Exploration provides additional knowledge through geology, mapping, geological exploration and geochemical surveys.

All phases of oil and gas operations affect the flora, fauna and ecological progression of an area. The pristine environment that scientists and educators need for comparison and contrast to man-dominated environments could be severely altered or lost.

Oil and gas leasing within the watersheds of waterbodies designated as statewide significance under the "Washington Shorelines Management Act" could affect the qualities being protected. These waterbodies are protected for public health, water quality, protection of the land, vegetation, wildlife and aquatic life, public access and navigation. Discrete actions of oil and gas operations could effect the quality of these waterbodies from much greater distance. The smaller the watershed the more significant the potential impact. A significant impact would arise if the waterbodies were used as a water source during drilling. Stream flows and normal water levels of lakes and reservoirs could be drastically reduced. Drilling might require as much as 25,000 to 30,000 gallons of water a day.

An extensive historical inventory has been completed in the lease application area. Sites seemingly insignificant may have been overlooked and not evaluated for their historical significance. These sites could be inadvertently removed or damaged during road construction, seismic testing or drill site development. Roads and seismic tests might also obliterate portions of historic trails. Oil fields developed near historical sites would endanger the sites if there are accidental fires, blowouts or oil spills. Structures could also change the mental mood a historical site projects to a visitor. Improved road systems would improve public access which increases the chances of vandalism. The weathered wood on buildings might be stripped,

weakened structures pushed over or the area might be ravaged by bottle collectors.

Road construction and clearing for seismic surveys poses the greatest threat to the preservation of archeological resources. Initial surface disturbance could alter archeological sites, by initiating erosion and causing soil compaction. Improved access provided by road construction might open up new areas increasing off-road vehicle use and the possibility of site destruction by relic hunters.

Drill site development has the potential for extreme disturbance in a confined area. An added hazard would be fluids used in the drilling operation if toxic fluids or additives were used. Discrete actions that could cause surface or subsurface disturbance include, but are not limited to: seismic surveys, road construction, borrow pits, trail clearing, settling, pond construction, pipeline construction, water storage and waste removal, and drill site development.

Any of the above mentioned discrete actions could affect the national significance of the Ryegrass Archeological District or any other archeological site.

Surface alteration and oil or gas field development might affect microenvironments containing traditional aboriginal food resources.

The wildlife-related recreation value is primarily dependent upon species populations and recreationists' ease of maneuverability. Road construction, oil field development and pollution of streams could disperse or reduce wildlife populations.

Sightseeing recreation has its highest value in a natural or undisturbed condition. The natural appearance of sightseeing recreation values could be altered by road and trail construction, drill site development, pipelines, sand and gravel pits, and other facilities constructed within proximity of these values. These impacts would be highest in the Yakima River Canyon and Ginkgo State Park which are managed for their sightseeing values. The quality of sightseeing values affects the composite value of other recreation areas. Seismic testing near fragile geologic formations and historical-archeological sites could weaken or collapse the structure.

Primitive values attain their highest values in an undisturbed condition. All phases and discrete actions of oil and gas leasing could be detrimental to the primitive values. Any construction or development could preclude future management of the areas for their primitive values.

The quality of waterbodies for watersports is primarily dependent upon water quality and quantity. Use of streams, rivers, lakes and reservoirs as a watersource for drilling or refining could reduce or eliminate the water supply for watersports. Drawdown of lakes and reservoirs would reduce the useable surface acreage, season of use and possibly expose hazardous sandbars and buried stumps. Reduced flows on streams and rivers might make them unsuitable for float boating.

The quality of an area for ORV use is primarily dependent upon size, variety and challenge of the terrain, and absence of hazards and restriction. Some phases of oil and gas operations could adversely affect ORV use by reducing the useable area and restricting maneuverability. Roads constructed for oil and gas purposes would probably be used by ORV's, posing a potential conflict of use.

The quality of collecting areas is primarily dependent upon the quantity and quality of the vegetative or mineral material being collected. Roads, trails and pipeline construction and drill site development could uncover mineral deposits making them readily available. These activities could also remove or substantially reduce the existing vegetation that is producing the collectable vegetative products. Development in high quality and quantity areas would force people to use less productive areas.

The only winter sports activity of any consequence identified in the lease application area is crosscountry skiing. Snowmobiling is covered under off-road vehicles. Important qualities are rolling terrain, adequate snow depth for several months and a ground surface relatively free of obstructions. Roads presently being used by crosscountry skiers might be kept open year long for access to oil and gas drill sites. Crosscountry skiing on these roads would no longer be possible.

The general criteria for state trail corridors are that they must provide access to recreation, scenic, historical or cultural features of statewide or regional significance, serve as a linking trail between trail corridors or provide

an excellent opportunity for a specific type of trail. All phases of oil and gas operations might affect the quality of the recreation, scenic, historical or cultural features of the trail corridor. Development of an oil field might interrupt continuous passage over a trail segment.

Recreation facilities are generally developed in a manner that will fulfill the needs of the anticipated user and place him in an environment relatively free of social pressures associated with city living. Oil and gas drill sites adjacent to developed recreation facilities would probably interupt the leisure and carefree atmosphere the recreationist is pursuing with lights, noise and odors. This would place him back into the city environment he was trying to escape.

Public access is a vital part of every recreation activity previously mentioned. Oil and gas operations might provide or deny public access. If public access is denied to developed oil and gas fields, present recreational use might be eliminated or new and possible less desirable access routes would have to be used. If access is allowed to continue more people would probably be attracted by the improved roads. Access might be provided to new areas where planning and facilities are not adequate to protect the recreation resource. After the abandonment phase, roads might deteriorate and be hazardous for public use.

The social welfare of the lease application area may be effected by the oil and gas operation.

Each phase of oil and gas operations would have some social or economic impact on local and regional areas.

The population of the proposed lease areas is generally of low density and stable to slightly growing. Initial exploration should result in a very small population inmigration. Discovery and production of oil and gas could result in significant population increases.

The potential impact might be minor due to the fact that there is an adequate labor pool in the lease application area. Past studies indicate the population increase will probably be 3-10 people/sq. mile. Since the oil and gas lease application areas are located in rural areas, the population

increase will probably occur in the rural areas. Even if a sizeable field is located, the population influx would probably last only 25-50 years unless new industry develops in the area to provide jobs.

The economic impact would depend upon the size of the exploration effort and the size of any field discovery. Employment and personal income in most cases represents the major economic impact. Oil and gas production many times results in rapid, unstable economic growth. Property values may be inflated. Secondary economic growth may occur in the trades and service industries. Local labor in most cases is used for 10 - 15% of the employment needs. Employment would help reduce the unemployment rate but would not be a substantial factor unless a major field is found. Use of local employment during the proposed exploratory and development phases would be generally temporary and consist of road and site construction and other field crew operations. Employment during the proposed production phase would be semi-permanent, lasting from 25-50 years. Oil and gas production could rapidly inflate local economic growth and employment opportunities and leave just as quickly in 25-50 years.

As the population increases in rural areas an additional load would be placed on social services. The added population would strain these services in the rural areas where they presently are barely adequate or deficient. Financing to expand social service in rural areas might be slow and the quality of services to everyone could suffer initially. The proposed abandonment phase could leave small communities with social services in excess of their needs and long term financial indebtedness.

The general consensus expressed in the lease application area is a need for a diversified economy that would expand business and bring in more industry. Equally important is protection of the natural resource base. Opposition might arise if oil and gas operations significantly interrupt existing economic land use. Opposition from individuals is foreseen where private individuals own the surface rights and the United States owns the sub-surface rights. Oil and gas development on these lands might change the present land use.

Development of a large oil and gas field close to populated areas might require additional zoning or rezoning of areas. Development of large oil and gas fields or land administered by other Federal and state agencies might require changes in existing management plans or objectives.

IV. Possible Mitigating or Enhancing Measures

In the following parts of this section, measures are described for mitigating the impact of oil and gas operations on individual components of the environment. Collectively, these measures represent actions which might be taken to maintain stable ecological interrelationships.

The effectiveness of mitigative measures generally would be most critical in preserving the natural balance in fragile ecosystems of low productivity, and in valuable aquatic ecosystems.

A. Nonliving Components

1. Air

The four stages of implementation identified earlier have various discrete operations that would contribute particulate matter and noxious gases which would have a low to moderate adverse impact on existing air quality.

Particulate matter could be minimized by requiring surfacing and watering of trails, roads, drill pads and construction sites when the dust content of the air exceeds state and Federal air quality standards. Strict enforcement of applicable laws, regulations and standards could do much to minimize the degradation of air quality. Prevailing winds should dissipate and disperse noxious gases that might arise from development activities. Air inversion problems could be mitigated by additional air pollution control devices. Unknown impacts that might occur from nonionizing radiation in the form of communication facility interference should be minimal, based on analysis of impacts occuring on or near other existing oil and gas projects. Anticipated impacts that may occur would be either low or moderate in intensity if no mitigating measures were taken. Existing laws and technology can readily abate the recognized air quality problems.

2. Land

The identified stages of implementation would have some adverse impact on the land. The impacts of off-road vehicle travel and preliminary road construction during the initial exploratory phase could be mitigated by restricting travel

when the soils are wet and by limiting the width of roads and trails. Restrictions could be made as to minimum grades and construction requirements, outslopes, water bars and culverts. Drill site locations would be approved prior to commencement of construction. Careful analysis of the proposed projects in association with the available soil data could help mitigate impacts. Road systems would not be duplicated between phases of development. Road surfaces could be gravelled, paved, or treated with a dust palliative and shoulders seeded with adapted species to reduce erosion problems. Roads could be rehabilitated and revegetated at time of abandonment.

Soil structure would be affected somewhat during any activity that necessitates the utilization of heavy equipment and structures. Soil disturbance problems could be minimized by analysis of the location of the road or structure and inclusion of appropriate mitigating stipulations in the lease. Soil compaction could be mitigated by restricting operation and development on the more fragile soils or limiting land use during wet periods. Soil pollution during the production phase could result from seepage or accidental spills from storage pipeline systems. This impact could be mitigated by requiring protective dikes around the storage area and stipulations that a specified maintenance and inspection schedule be established and followed. Inspection requirements could include subjecting the drill holes and pipes to abnormal pressures in order to determine leaks. Various valves, pumps and key pipe joints could be x-rayed periodically.

3. Water

The use of ORV's could be mitigated somewhat by specifying stream crossing sites where the stream bottom is rocky enough to preclude the dispersion of sediment. The permits could require rock surfacing at approaches to stream fords. Road building activity in close proximity to streams could be mitigated by required bridges, culverts, and riprapping at sensitive areas. Surfacing requirements would mitigate impacts in the more problematic areas.

The Yakima River from Sunnyside Dam to Wilson Creek has special temperature conditions. These could be mitigated by following the rules established by Washington Administrative Code, Chapter 372-64-040-155, of "Intrastate Water Quality Standards."

The actual water quality of streams could be monitored by establishing checking stations along the streams. These stations would have measuring equipment similar to that presently used by the USGS. Comparisons of the sedimentary load could be made before, during and after various operations. Determination of sediment yield changes could be made if sufficient base line data is obtained.

Drilling and other development work could be restricted in drainages or in close proximity to running water. Analysis of the lessee's operational plans could help identify sites that would be fairly "safe". Drilling permits issued by the USGS and State of Washington have stipulations that would require the operator to take adequate precautions to contain and safely dispose of caustic drilling fluids and brines, (Appendix G). Wells could be cased and properly sealed to prevent contamination of groundwater aquifers. Slant drilling and cluster-well techniques could be required where needed to protect stream channels and margins of lakes, marshes and estuaries. Mud pit berms should be large enough to contain the drilling fluid and anticipated additions due to rainfall.

Sewage disposal systems could be designed specifically for the soil and water conditions at each site in accordance with county laws. Water from producing oil wells or separation facilities could be reinjected to safe levels or contained to prevent contamination of surface waters. Proper cleanup, removal and burial of wastes during the abandonment phase would mitigate adverse impacts to the water quality. Wells and drill holes would be capped to mitigate additional impacts. Buried pipe systems should be flushed out, sealed and marked after the project is abandoned. Above ground systems should be removed. Seeding and fertilizing disturbed areas would help to prevent erosion.

B. Living Components

1. Plants (Aquatic)

During exploration and development phases, roads, pipelines and other facilities could be located to minimize the destruction of aquatic vegetation at stream crossings and to avoid disturbance to aquatic habitats.

Possible mitigating measures to reduce the impacts on aquatic habitat associated with road construction and other surface activities during the exploration, development, and production phases could include: special consideration to roads and construction sites in fragile area; exclusion of critical aquatic habitat areas from surface activities; that denuded river or stream banks be replanted with grasses, forbs and shrubs; installation of structures to create pools where river or stream beds have been scoured; non-removal of material from river or stream channels unless a permit is obtained from the appropriate state agency with an approved plan to protect aquatic life and prevent siltation; channelization of rivers or streams.

Loss of ground water from shallow aquifers would be minimized by casing drill holes and wells.

Mitigation of blowouts could be accomplished by blowout preventors, good safety and maintenance procedures, locating drilling sites away from surface waters, constructing dikes around drilling sites, using contingency plans to cover adverse impacts from blowouts, and keeping necessary equipment on hand to clean up impacted water as soon as possible after a blowout. Equipment could be available to suppress fires started during blowouts, as well as from explosions or other accidents.

Impact of oil on aquatic vegetation from sources other than blowouts could be minimized by installing monitoring systems in pipelines to detect and shut down mechanical failures; constructing berms around storage batteries, tanks and separators; giving protective coatings and cathodic treatment to prevent corrosion of pipes; insuring that evaporation pits are of sufficient size and constructed of impervious materials; reinjecting waste oils and separated hydrocarbons into the production formation; and adequately capping wells during abandonment to prevent oil from escaping into surface and subsurface water supplies.

Mitigative efforts to keep toxic materials from killing aquatic vegetation could include adequate well casing, preventing well blowouts, locating wells away from streams or lakes, proper containment and reinjection of briny water into producing formations, proper construction and size of evaporation pits, and adequate sealing of wells during abandonment.

2. Plants (Terrestrial)

The amount of vegetation destroyed by clearing activities during most phases of oil and gas operations could be minimized by limiting the number of dimensions of roads, pipelines, trails, test wells and camp facilities. Only those actually needed to accomplish the job should be constructed; existing facilities should be used whenever possible.

Vegetation destruction as a result of erosion could be mitigated by appropriate controls which include designing roads, pipelines and well sites to insure optimum drainage; adherence to maximum grades and use of waterbars to slow water flow; insuring that culverts discharge water on non-erodible material, and keeping soil and debris out of streams; locating roads, pipelines, well sites and camp facilities where soils are stable; employing such construction requirements to minimize erosion such as end hauling of soil in lieu of sidecasting, assuring that cut and fill slopes lie at the normal angle of repose or less, and using surfacing material to stabilize road surfaces; disposing of end-hauled material in locations not subject to erosion; revegetating all disturbed areas promptly after the disturbance.

Soil compaction impacts that affect vegetation could be mitigated if operations are confined to planned locations and operations are confined to the dry season. Compacted soils could be rehabilitated by ripping during the dry season and followed with appropriate revegetative practices.

Vegetation destruction due to contamination by oil or briny water during any or all phases of oil or gas leasing could be mitigated by: locating wells and storage facilities away from drainage; constructing dikes around all facilities that generate or store contaminants; using proper mud weight for drilling and blowout prevention equipment; using tanks to contain fluids which may flow from wells during drill stem tests; not discharging contaminated water or other toxic material into streams or on the ground surface uncontained; re-injecting brine into a safe strata rather than using evaporation pits, or by using only lined evaporation pits of sufficient size to preclude leakage or overflow; development of, and adherence to, contingency plans for controlling blowouts, spills and leaks; installing monitoring systems to detect and shut down mechanical failures which could result in leak or spills; casing all wells and test holes where a possibility

that oil and brine could mix with aquifers. Immediately upon abandonment, seal wells, remove storage tanks and flow lines, and drain mud pits and sumps.

Destruction of terrestrial vegetation and lowering of site productivity by wildfire could be prevented or reduced by complying with applicable existing Federal and state fire regulations.

Impacts of air pollution on vegetation caused by various activities associated with oil and gas operations could be mitigated by: action taken to guard against blowouts, using mud as a controlling and circulating medium during drilling instead of natural gas, utilizing natural gases rather than disposing of them by venting or flaring, disposing of waste oil by reinjection or other non-polluting methods rather than burning, implementation of new control devices for individual well settings, implementation of known techniques for removing hydrogen sulfide, sulfur oxides, and hydrocarbons from refinery emissions.

3. Animals (Aquatic)

Most of the possible mitigative measures listed in the Plants (Aquatic) section are also applicable to Animals (Aquatic).

It would be important to avoid the contamination of waters either directly with chemical and organic wastes or indirectly by polluting the soil and leaching of contaminates into local streams or ground water should be avoided.

Mitigating measures which could be considered are: preplanning the network of roads required for the whole operation; roads should be built to approved standards and located so as not to contaminate streams with sediment; proper installation of culverts would be essential for the passage of both resident and anadromous fish; the alteration of streams and stream banks should be avoided. Erosion could be reduced by seeding stream banks to adaptable species. Exposed surface areas could be planted as soon as possible after disturbance to reduce erosion; installing structures along streams to create pools; add gravel above instream structures to establish spawning areas if streams have been altered; restricting removal of streambed material for construction or other purposes; using blowout preventors and secondary dikes around proposed drilling sites, and the location of drill sites away from surface water could protect the aquatic environment; critical aquatic habitat

be restricted or excluded from surface activities; monitoring systems in pipelines to detect and shut down mechanical failures could be required.

4. Animals (Terrestrial)

Many of the possible mitigative measures listed in the Plants (Terrestrial) section are also applicable to Animals (Terrestrial). Mitigating measures which could be considered are: providing adequate storage facilities; roads could be preplanned to utilize existing roads and trails rather than building new ones; good safety practices and maintenance procedures could eliminate most of the accidents resulting in fire and explosions, which might destroy wildlife habitat; accidental contamination of animal water supplies by drilling water or mud could be reduced by utilizing adequate storage facilities such as metal storage tanks or leak proof pits; direct loss by death or entrapment of wildlife in storage pits and holding tanks could be reduced or minimized by fencing or covering the exposed area; underground or modified powerlines could be considered for use through areas of high bird concentrations to reduce the death rate of raptors from electrocution; locating power poles away from roads to reduce the death rate caused by illegal shooting; restrictions could be imposed to limit drilling in critical big game wintering areas; sensitive or important raptor nesting grounds in the Yakima River Canyon and sage grouse strutting grounds - Buffer zones around these areas could be established; in areas where water for small animals and birds is a problem, guzzlers could be installed to mitigate the loss of a water supply caused by drilling; consideration could be given to restricting operations on critical sites during nesting period.

C. Human Interest Values

1. Landscape Character

To help reduce unnatural contrasts in sensitive areas, above ground facilities could be painted to blend with the natural colors of the area, and located away from ridge tops where they are easily visible. Tanks and pipelines could be buried in sensitive areas to reduce visual contrasts. Through

thoughtful planning and good design, oil and gas pipelines and roads could be made to blend gracefully with the natural landscape. In some highly traveled recreation or scenic areas, limited occupancy or disturbance could be authorized after on-site inspection.

The Yakima River Canyon is one of the most sensitive visual areas in the Columbia Basin physiographic area. This 18 mile stretch of road between Yakima and Ellensburg, shown on the "Visual Resources Map II-12", is Class II scenery. Drilling or surface occupancy could be permitted where it cannot be viewed from Highway 821. Drilling operations in the scenic corridor could damage the visual qualities of this picturesque area.

Other Class II scenic areas which require special attention are the Naches and Tieton River portions of the Snoqualmie National Forest. Surface occupancy of sites visible from the White Pass Highway 12 between Tieton Dam and the junction of Highway 12 and Highway 410 should be carefully selected to limit any intrusions into the scenic corridor. Drilling should be restricted in Class II areas along Highway 410 adjacent to the national forest boundary between Naches and Cliffdell. Drilling activities on the south side of Cleman Mountain above the towns of Naches and Tieton would also be visible from Chinook Pass Highway 410, a highly scenic route.

Portions of some lease application areas adjacent to the Columbia River, between the Vernita Toll Bridge and the town of Beverly, are visible from Highway 243. This area is quite scenic and drilling could be permitted in limited areas and selected locations out of view from the highway. The portion of the Columbia River below Priest Rapids Dam to the McNary Dam pool is the only free flowing section remaining on the Columbia River System, and needs visual protection in several selected areas. It might be necessary to resort to slant drilling on some sites for protection of scenic values.

In Class III areas drilling could be permitted under stipulations which produce minimal disturbances to the visual resource. These enhancing measures would be minimal road disturbance, protection of watershed and vegetation through seeding, and grading of disturbed areas. Painting of above ground structures with non-reflective paint would also help in these sensitive areas. Pipelines and access roads could

be routed along natural lines of the landscape, such as toe of slope, changes of natural vegetation or draws and ravines.

In Class IV scenic areas stipulations could be less restrictive. Care still needs to be exercised to protect the visual values.

2. Sociocultural Interests

Geological, paleontological, ecological, and hydrological areas of high educational and scientific value could be excluded from oil and gas operations or protected with discrete lease stipulations. Educational and scientific sites come in a wide variety of sizes and types. Specific stipulations should be handled on an individual case basis.

General guidelines would be to keep impacts at a distance or along the perimeter of high value areas. High value sites might need to be signed or fenced. High value sites could be avoided at the expense of lower value sites. Oil and gas crews could be educated about values in the area where they are working. Disturbed sites could be restored to a near natural condition. Lease application areas within the watershed of shorelines designated under the "Shoreline Management Act of 1972" could contain stipulations to protect those qualities. These qualities could change with each shoreline or along portions of a shoreline. Stipulations on consumptive use of these waterbodies might be necessary.

An intensive inventory could be made to locate unidentified historical sites to determine their significance. Historic significance could dictate the extent to which mitigating measures are needed. Areas of high historical value could be excluded from the lease or searched and artifacts cataloged by qualified persons prior to on-site activity. Development and production activities could be kept away from historic sites by slant drilling. Vehicular traffic and road construction could be held away from historic trails by careful pre-location. It would reduce vandalism if roads were not developed near historic sites without a visitor management plan. Oil and gas people would be notified of the historic values in the area and required to protect them. Valuable sites might need to be signed or fenced.

As previously mentioned, the majority of the lease areas are relatively unknown archeologically. It is important that the impacts of oil and gas development be minimized if these resources are identified on the area. This could be accomplished, in most cases, by a slight relocation of the proposed drill site area. Toward this end a thorough archeological reconnaissance could be required through the standard lease stipulations. In the event that the proposed activity could not be relocated, test excavation or salvage operations could be required under the supervision of qualified persons. The Washington State Historic Preservation Officer should be afforded the opportunity to comment on any and all proposed operations.

Recognition of major food and herb collecting areas is the first step toward avoiding major destruction of this cultural resource. Oil and gas fields could be laid out so that access would be available to the more productive food gathering areas.

While oil and gas operations and recreation are not totally incompatible, it would probably be advantageous to both parties to segregate the two uses.

Areas of exceptionally high wildlife-related and sightseeing recreation value could be excluded from leasing at the expense of lower quality areas. If exclusions are not practical, stipulations could be added to the oil and gas lease to mitigate the impacts.

Roadless areas could be avoided by road system planning. Roads and drill sites in ORV areas should be considered in the planning.

Leases could be examined to determine potential water sources to be used. Stipulations might be needed to assure that the watersports values of the waterbodies are retained.

Rockhound areas could be excluded from leasing or protected with stipulations at the expense of less desirable areas. The outstanding collecting areas should be identified.

Roads and trails used for cross-country skiing could be identified. Access for oil and gas operations could be routed around these roads and trails or alternate trails could be constructed where this is not possible.

Oil and gas operations could be located so as not to interfere with continuous passage in the state trail corridors. The recreation, cultural and scenic values within

the corridor could be protected on an individual case basis with lease stipulations.

The adverse impacts of drill sites located in proximity to recreation sites could be mitigated by keeping the operations out of sight and sound of developed recreation facilities. Odors should be reduced whenever possible.

In areas where public access is provided, a visitor management plan could be written. Oil and gas operations could be located in a manner to minimize their restrictions on public access. Potentially hazardous roads on NRL could be added to the road maintenance plans or closed to traffic.

Regional economic and social impacts could be mitigated with early development of comprehensive plans that address the issue of oil and gas leasing and land use controls. Social, economic and natural resource goals could be identified. Alternative measures could be developed to reduce or eliminate the impacts.

Extraction of oil and gas resources in rural areas, lacking industry, adds little economic benefit to the local region. Severence or depletion taxes would give local government a share of the economic benefits, easing the eventual economic slowdown as production tapers off and abandonment occurs.

Part of the oil and gas royalties collected by the Federal government is returned to the state. The state's share of the royalties amount to thirty-seven and one-half percent of the gross receipts the U.S. collects from leasing and production. These receipts could be used to meet the added need for social services.

Oil and gas operations could provide year long employment for minorities that have a high unemployment rate due to the seasonal nature of their primary employment, agriculture.

The loss of surface use by private landowners from oil and gas leasing, where the United States owns the subsurface, could be mitigated by excluding those lands from the lease or by providing stipulations to nullify the loss.

When mitigating impacts, it should be noted that the majority of the private land within the lease application

area has already been leased for oil and gas. The rate for leasing of private lands in this area is reportedly $1.00 per acre per year. Federal lands are leased at $.50 per acre per year as provided for in Federal regulations.

Impacts on local regulatory structures could be mitigated by early development of comprehensive plans that address the issue of oil and gas leasing and land use controls.

V. Recommendations for Mitigation

Most of the possible mitigating measures proposed in this report will be accomplished through enforcement of the existing state and Federal laws and regulations governing exploration and development of oil and gas fields.

Appendix "E" of this report is a summary of normal mitigating stipulations used by BLM. The required Washington State regulations and stipulations are in Appendix "G".

As the "site specific" analysis are performed, the desired stipulations should be selected and incorporated into the operating plan. Both Federal and state stipulations are designed to protect the environment and yet allow the lessee reasonable operating procedures.

BLM Forms 3109-5 and 3040-4 in Appendix "E" contain stipulations that protect the environment from surface disturbance, air and water pollution, restrict activities such as road building so as to limit potential erosion, protect vegetation, water bodies, water tables, existing fixtures, facilities and the natural well being of the area.

The following is a list of mitigative measures that should be covered by selecting the proper stipulations from available Federal and state stipulations:

1. Activities employing ATV's should be conducted in such a manner to minimize surface damage.

2. Drainage systems should not be blocked. No cuts or fills should be made near or in streams which would result in siltation or accumulation of debris in the stream. All damage to streams should be repaired to the satisfaction of the authorized officer.

3. All operations should be conducted so as not to change the character or cause pollution of streams, lakes, ponds, waterholes, seeps, and marshes or cause damage to fish and animal resources.

4. Surface damage which might cause soil movement by wind or water or water pollution should be corrected to the satisfaction of the authorized officer.

5. Vegetation should not be disturbed within 300 feet of any waters designated in a proposed lease area except at authorized stream crossings.

6. No explosives should be used without prior written consent of the authorized officer.

7. Trails and campsites should be kept clean. All garbage and foreign debris should be eliminated by removal or burial. Burning should be permissible only by prior written consent of the authorized officer.

8. Existing roads and trails should be used whenever possible.

9. All survey monuments, witness corners, reference monuments, and bearing trees should be protected against destruction, obliteration, or damage. Any damaged or obliterated markers should be reestablished in accordance with accepted survey practices.

10. The operator should take every effort to prevent, control or suppress any fire in the operating area. Reports of uncontrolled fires should be immediately sent to the authorized officer or his representatives.

11. The operator should fill all holes, pits, and excavations to the extent agreed in the approved plan and grade to the natural contour.

12. Disposal sites should be selected and prepared to avoid downward percolation of pollutants into aquifers.

13. Disposal systems for solid and liquid waters should be designed and constructed to avoid landslides, control wind and water erosion, and establish conditions conductive to vegetative growth in the disposal area.

14. Excavations used for the impoundment of water should be graded to establish safe access to water for persons, livestock, and wildlife.

15. Except for solid rock faces, bench faces and excavations used for impoundment of water, those surface areas of the lease application area, disturbed by operations conducted by the lessee should be revegetated when their use is no longer required by the operator. Species, methods, and season of seeding or planting, should be specified.

16. Backfilling, final grading, and revegetation should be completed within two (2) years after the completion or termination of the particular operation involved.

17. Drill holes should be permanently sealed or filled as directed by the authorized officer upon completion of operations.

18. Surface buildings, supporting facilities, and other structures which are not required should be removed and the area graded and revegetated.

19. All operations should be conducted to avoid range and forest fires and spontaneous combustion. Open burning of carbonaceous materials should be in accordance with suitable practices for fire prevention and control and according to state and Federal regulations.

20. The area of operation should be appropriately posted and fenced, or otherwise protected, to minimize injury to persons, livestock, and wildlife.

21. All access, haul, and other support roads and trails should be constructed and maintained in such a manner as to control and minimize channeling and other erosion. Roads and trails should be constructed only at locations approved by the authorized officer.

22. Roads not needed after closeout should be closed by barricades or protected from erosion by placing of water control bars or outsloping as required by the authorized officer.

23. Existing improvements, including but not limited to, fences, gates, cattle guards, roads, trails, culverts, pipelines, bridges, public land survey monuments, and water development and control structures should be maintained in serviceable condition. Damaged or destroyed improvements should be replaced, restored or appropriately compensated for.

24. When agreed by lessee and lessor, the lease site should be available for other public uses including, but not limited to, livestock, grazing, hunting, fishing, camping, hiking and picnicking.

25. Discovery of historical or archeological values should be immediately reported to the authorized officer and steps taken to protect the site until qualified persons can evaluate the site.

26. Leaks or spills from pipelines or other facilities should be corrected or treated promptly.

27. Prior to entry upon the land or disturbance of the surface, the lessee should submit for approval a map and an explanation of the nature of the anticipated activity and surface disturbance to the authorized officer or area oil and gas supervisor. He should also furnish the appropriate surface management agency with a copy of such map and explanation.

28. Any drilling, construction, or other operations by the lessee that would disturb the surface or otherwise affect the environment should be subject to prior approval by the area oil and gas supervisor, in consultation with the appropriate surface management agency.

The following are stipulations for specific situations which should be incorporated into the appropriate leases.

1. The Yakima River, from Wilson Creek to Sunnyside Dam, has special temperature conditions. These conditions are spelled out in WAC 372-64-050(155), "Washington Intrastate Water Quality Standards Provisions". All leases on or along the Yakima River now and in the future should provide for these restrictions.

2. Lease applications 13456, 13564 and 15442 are on or border on sensitive and important raptor nesting sites in the Yakima River Canyon. If leases are issued on these applications, operations should not be allowed within one-quarter mile of known nesting sites during the nesting period from March through June.

3. The scenic values of the Yakima River Canyon should be protected. Lease applications 13448, 13456, 13460, 13470, 13504, 13563, 13564, 13640, 13856, 15442, and 15443 are on or adjacent to the Yakima River Canyon. If leases are allowed on these applications there should be consideration given to slant drilling, locating operations in "unseen areas" or complete restriction of operations on portions of those lease applications where relocating is not possible.

4. The sage grouse strutting grounds in T. 15 N., R. 24 E., Section 12, on private land adjacent to lease application 13506 and 13426, and T. 15 N., R. 25 E., Section 7, on private land north of application 13427, should be protected. A one-quarter mile buffer strip should be provided around the sage grouse strutting grounds. Operations should not be allowed within one-half mile of the grounds during the period from April through July.

5. There are big game wintering grounds on private and state lands adjacent to lease applications 13448, 13563, 13787 and 13789. If leases are granted, operations within one-half mile of these wintering grounds should not be allowed from December through March.

O = List B

= = List D

— = list C
○ = list B

6. The lessee should be required to protect critical aquatic habitat, water quality, nesting sites and spawning grounds. No operations should be allowed within 300 feet of water bodies on the following lease applications: 13782 and 13783 in the Frenchman Hills, 13448, 13456, 13564, 13640, 13856, 15433 and 15442 on or adjacent to the Yakima River, and applications 13459, 13632, 13633, 13634, 13636, and 13786 on the Columbia River.

7. If oil or gas is discovered in or adjacent to areas of high recreational value, such as the Yakima River Canyon or the Tieton Canyon, USGS should require the lessee to control or eliminate any hydrogen sulfide odors that might arise from that operation.

8. Surface occupancy of sites visible from the White Pass Highway 12 between the Tieton Dam and the junction of Highway 12 and 410 should be restricted to eliminate intrusions into this scenic corridor.

All drilling programs would normally be coordinated between the USGS, the appropriate land management agency and the surface owner to provide adequate environmental protection of the lease application areas.

VI. Adverse Impacts That Cannot be Avoided (Residual Impacts)

A. Plants (Aquatic)

Some aquatic vegetation would be destroyed or buried by oil and gas operations.

Operations in water habitat would increase sedimentation of aquatic ecosystems above natural levels despite all mitigative efforts to prevent it. The long term effects of excessive sedimentation are often more serious to aquatic plants in shallow-water habitats.

Unavoidable loss of groundwater may occur, but it is impossible to forecast or estimate.

Leaks or spills from pipelines or storage facilities could occur periodically causing pollution of surface waters despite contingency plans and quick clean ups. Impact would be short term in nature.

B. Plants (Terrestrial)

Some terrestrial vegetation would be destroyed by oil and gas leasing operations.

Accidental leaks or spills could cause adverse impacts that cannot be remedied. Their significance depends on the magnitude.

C. Animals (Aquatic)

Regardless of the precautions taken during the mitigating processes there would be an increase in soil erosion. This sediment loss would come from the building of new roads, pipelines and other construction sites. The degree of damage to aquatic life would be dependent upon the type of soil, slope of the land surface, climatic conditions and amount of development.

Little can be done to mitigate the effects on aquatic habitat of large land slides that may result from operating in steep terrain.

Accidental oil leaks and spills tend to occur sometime during oil and gas operations. Loss of aquatic animals and impact on the environment would be variable, dependent on the amount of contaminant spilled, the size of area, and whether or not the pollutant reached a water source.

Ground waters can become contaminated when a well blowout occurs.

Loss of ground water is possible by conducting stratigraphic testing, well drilling and operational activities. When this occurs, small springs or marsh areas could dry up causing death to all aquatic species utilizing the area.

The long-term ecological effects of excessive sedimentation of rivers and streams often have a greater impact on aquatic species than the immediate, short-term effect of accidental deaths.

D. Animals (Terrestrial)

Surface areas utilized for building or other construction would directly remove habitat from animals having small home ranges. Larger animals might move into adjacent areas but smaller animals would be killed or displaced.

Man's activities and noise disturbance would not be entirely mitigated because many species move out to avoid the harassment.

Water tables might be lowered by extensive oil and gas development or associated increased domestic use.

Impact on livestock forage would be proportional to the average removed from use. Accidental fires could reduce the amount of forage availability on the short-term.

E. Ecological Interrelationships

Oil and gas operations would upset the natural balance of ecosystems, at least temporarily. Fragile ecosystems, where plant productivity is low and the natural balance delicate, would be most severely impacted and slowest to recover, particularly where the ecological equilibrium has been impaired by other human activity prior to oil and gas operations.

F. Human Interest Values

The visual resources would be unavoidably disturbed during all phases of oil and gas operations. Interruption of vegetative

patterns, soil movement and structures affect the form, line, color and texture of the natural landscape.

Mitigating measures would lessen the impact with time. The time frame for mitigation would be dependent upon the intensity of the impact and ease of rehabilitation. Many of these impacts could not be entirely mitigated.

Some educational and scientific areas would be disturbed by oil and gas operations. Fragile areas and areas where studies are presently being conducted would be the most severely impacted. Some historical and archeological sites would be inadvertently disturbed. Adverse impacts would be restricted to the initial disturbance through mitigating measures. Some historical and archeological sites would be unavoidably vandalized with improved access. Additional social services would be needed as oil and gas operations bring people into rural areas. A small amount of short-term economic instability would be unavoidable. In most instances oil and gas operations would adversely affect recreation resource but the impacts could be mitigated. Recreation access, whether provided or denied, would be affected.

VII. Relationship Between Short-Term Use and Long-Term Productivity

This section focuses on the relationship between short-term use of the environment for oil and gas operations and the long-term productivity of the environment and its maintenance for other uses.

"Short-term" use refers to the period during which oil and gas operations would take place. It would extend from exploration through abandonment and completion of reclamation. The short-term may vary from a period of several months, if preliminary investigations or wildcat drilling were unsuccessful, to up to 50 years if commercial amounts of oil and gas were discovered.

"Long-term" is the period of time extending beyond completion of all possible restoration.

A. Nonliving Components

1. Air

Microclimates would be permanently modified in areas where roads and other developments were maintained after oil and gas operations were abandoned and on those abandoned drill sites and roads in which the vegetative cover could not be restored to its original state.

2. Land

If oil and gas were discovered and developed, its use in the short-term would preclude long-term use of the reserves for energy or as raw material in manufacturing processes. If oil and gas activities caused geological subsidence, the effects would extend into the long-term future.

Long-term productivity would be reduced if oil and gas activities caused soil erosion or compaction. Productivity losses would be greatest in areas directly affected by facilities such as mud pits, structures, roads, and toxic waste disposal sites.

Oil and gas operations would have long-term impacts in areas with unique wilderness or highly significant recreational values. In forested areas, timber production would be curtailed during the life of the oil and gas

operations on those sites occupied by the operations. Long-term timber productivity could be impaired by soil erosion resulting from oil and gas activities. Farming and livestock operations would be restricted during the operation of the field but could be resumed after it was abandoned. Oil and gas activities in developed areas could attract other industrial and commercial activity and detract from the long-term value of the area for residential uses.

3. Water

One long-term effect of the construction of roads and other facilities required in oil and gas operations would be increased stream sedimentation. Mitigative measures could reduce, but probably not entirely eliminate, sedimentation resulting from development activities on steep slopes. A very long period of time might be required for small streams to regain a state of equilibrium.

If ground water aquifers were inadvertantly contaminated, it might take many years for the effects to be noted.

B. Living Components

1. Plants

The long-term productivity of terrestrial and aquatic plants could be reduced by construction activities, earth slides, accidents, human errors, and mechanical failures associated with oil and gas operations.

The potential for long-term negative impacts on terrestrial vegetation would be greatest in areas with steep slopes, unstable soil, or fragile ecosystems. On sites where oil and gas activities caused soil erosion, compaction, or pollution, productivity could be reduced to the extent that native plant species could not be established after the sites were abandoned. Only brush or forbs might grow on sites which previously supported stands of coniferous forest.

Destruction of vegetation, if roads and pipelines are built across or adjacent to aquatic habitats, would result in reduced long-term productivity. An earth fill or sidecast placed in the aquatic habitat might remain there after a facility is abandoned.

Large oil spills reaching surface waters could have a detrimental long-term impact on vegetation in the vicinity of the spill. Production of aquatic vascular plants, algae and phytoplankton, could be adversely affected, causing reduced production of all organisms throughout the food chain.

The long-term effect of increased sedimentation from oil and gas operations would shorten the life span of some aquatic ecosystems, thus eliminating aquatic plants from the environment sooner than under natural conditions.

Aquatic vegetation in small springs or lakes could be lost if shallow aquifers were drained during well drilling.

2. Animals

Accelerated sedimentation caused by oil and gas operations would adversely affect the long-term productivity of aquatic wildlife. The long-term ecological impact of sedimentation in streams and lakes would be reduced production of indigenous cold water fishes. Habitat conditions would become more favorable for nongame species that thrive in warm and shallow waters; coldwater species would be reduced in numbers or eliminated from the area. Some aquatic insects would be affected in a similar manner by changes in habitat caused by sedimentation. Earth slides triggered by road construction could continue to occur after an oil field was abandoned, creating further adverse long-term impact on streams.

Oil pollution of aquatic ecosystems from blowouts, leaks, and spills could reduce the long-term biological productivity of streams and lakes. Plankton could suffer long-term adverse effects from oil pollution, as could populations of species utilized by man.

Consumption of surface and ground water during oil and gas operations could cause a short-term depletion of water supplies, but impacts on aquatic habitats and fish populations could be long lasting. Ground water levels and aquifer pressures could be lowered, thus decreasing the flow of springs. This could eliminate small springs, marshes, or ponds that are habitat for some species of fish.

Oil and gas preliminary investigations and exploration would not reduce long-term productivity of the lands as wildlife habitat unless endangered species were affected. If oil were located, subsequent development and production could

have a short-term effect on wildlife through loss of wintering, breeding, production and migration areas. After production and site abandonment, the ecosystem might not be entirely rehabilitated. Human settlement and accompanying development might remain after oil and gas fields were depleted. Wildlife formerly found in the area might not use the habitat due to changes in land use. Wildlife species such as rabbits, ground squirrels, other mammals, birds, and insects and the small predators that prey on them might reinhabit portions of their former habitat.

C. Ecological Interrelationships

Short-term actions, such as oil and gas operations, pose their greatest threat to the continuing productivity of those ecosystems which contain plants with low growth rates and animals with low reproduction rates. Such ecosystems recover slowly from abuse. These conditions are less characteristic of the Canadian Life Zone than they are of other life zones in Washington. In any life zone oil and gas operations would alter the natural balance and reduce long-term productivity where permanent roads and structures were installed and where mass soil movement occurred. The productivity and ecological equilibrium of aquatic habitats in streams and lakes could be permanently affected by actions associated with oil and gas operations.

D. Human Interest Values

1. Landscape Character

Oil and gas operations would constitute a short-term visual intrusion. After abandonment and rehabilitation some visible evidence would remain and constitute a long-term impact. Remaining visible scars would impose the greatest impact upon areas of high visual resource quality.

2. Sociocultural Interests

Oil and gas operations would have a long-term adverse affect upon primitive values, natural areas and fragile recreation resource values. Nonrenewable archeological values could substantially be altered or destroyed.

VIII. Irreversible and Irretrievable Commitment of Resources

A. Nonliving Components

1. Air

If land slides exposed bedrock and precluded revegetation or if new roads were constructed or paved for continued use in the area, the microclimatic changes brought about by the loss of vegetation would be irreversible.

2. Land

The major irreversible impacts on geologic resources would be the consumption of oil and gas and the commitment of construction materials such as sand and gravel for the development of the oil field.

Actions which destroyed topsoil or caused erosion could permanently affect productivity. The magnitude of the impact could be reduced by implementing appropriate mitigating measures.

The effects of oil and gas operations in unique natural areas or significant recreation areas could be irreversible. To a large extent, agricultural and forestry land uses could be resumed after a field was abandoned. Urban development resulting from oil and gas production could establish long-lasting land use patterns.

3. Water

If there were no accidents, failures or pollution in any phase of oil and gas activity, there would be no irreversible and irretrievable commitment of water. However, some accidents probably would occur in spite of precautions. If ground water aquifers were contaminated, water quality could be reduced for long periods of time.

If geologic collapse occurred, ground water aquifers could be permanently impaired.

B. Living Components

1. Plants

If ground water aquifers were drawn down excessively, aquatic habitat in small springs, streams or lakes could be

permanently dried up, resulting in an irretrievable loss of aquatic vegetation.

The natural conversion of standing water habitats to land masses could be accelerated by oil and gas operations which contributed to sedimentation. Massive earth slides are the most visible sources of sedimentation. The cumulative effect of increased sediment from such actions could cause the greatest effects on aquatic plants, especially in lakes.

Small amounts of aquatic vegetation would be eliminated at road and pipeline water crossings.

If all or most of the soil on a site were eroded or removed in a mass movement, the effect on vegetative productivity could be irreversible. If oil and gas operations contributed to the elimination of a plant species, the effects would be irreversible.

2. Animals

Since oil and gas operations increase the sedimentation reaching surface water, excessive sedimentation could cause irretrievable changes in aquatic habitat.

Once excessive siltation destroys a stream habitat, it may never be restored to its original condition by natural processes.

It is not anticipated that the proposed oil and gas operations in Washington would result in the loss of an endangered species. If this did occur, it would represent an irreversible and irretrievable commitment. Small, nonmobile species dependent on a microsite or other limited habitat would be especially vulnerable.

Discovery and development of an oil field might result in permanent urban development. The loss of habitat and attendant human activity could result in the loss or displacement of major game species and the larger predatory birds and animals. Fish and wildlife production foregone during any period of development would be forever lost.

Heavy industrial and domestic water use could lower water tables, drain marshes and other wetlands. Waterfowl, other birds, amphibians, and small mammals formerly inhabiting the wetlands might be displaced or permanently lost.

C. Human Interest Values

1. Landscape Character

If properly planned and carried out, mitigation and rehabilitation measures could be able to restore aesthetic values in many areas. The original character of the landscape might never be retrieved, if road building or other construction activities trigger land slides or other mass soil movements.

2. Sociocultural Interests

The impact upon primitive values, natural areas and fragile nonrenewable recreation resources could be irreversible. Archeological sites might be destroyed leaving only a written record of the site.

XI. Intensity of Public Interest

On October 16, 1975 letters with an Environmental Analysis Checklist attached were mailed to 192 individuals, groups, universities, Washington State agencies and Federal agencies. Two mailings were returned with no forwarding address, 23 replies were received from interested individuals, groups and agencies for a twelve percent return. On October 22, 1976 a press release was made to leading daily papers in eastern and central Washington. Articles were observed printed in the Yakima Herald-Republic of Yakima, Washington on October 29, 1975, and the Tri-City Herald of Pasco, Washington on October 26, 1975. Releases were also made to local radio and TV stations on October 22, these releases apparently were not used.

The following sent letters, information or posed questions as a result of our mailing of October 16:

Schools
Central Washington State College - Ellensburg, Washington
Washington State University - Pullman, Washington
University of Washington - Seattle, Washington

State Agencies, Olympia, Washington
Washington State Advisory Council on Historic Preservation
Washington State Parks & Recreation Commission
State of Washington Department of Natural Resources
Washington Department of Game
State of Washington Department of Fisheries
State of Washington Interagency Committee for Outdoor Recreation
Washington State Highway Commission Department

Federal Agencies
USDI, Bonneville Power Administration - Portland, Oregon
USDI, Bureau of Outdoor Recreation - Seattle, Washington

Clubs
Intermountain Alpine Club - Richland, Washington
Palouse Group Sierra Club - Pullman, Washington
Washington State Sportsmans Council - Vancouver, Washington
Environmental Research Group - Seattle, Washington

Persons
Margaret Craig - Seattle, Washington

Businesses - Chamber of Commerce
Department of Commerce and Economic Development - Yakima, Washington
Cle Elum Chamber of Commerce - Cle Elum, Washington
The Washington Water Power Company - Spokane, Washington
PACO - Realestate - Bellevue, Washington
Rutherford, Kargianis and Austin Law Office - Seattle, Washington

The groups expressed various concerns generally related to their fields. The mailing list and replies are on file at the Spokane District Office for review.

As of this writing there are five individuals and oil companies that have applied for oil and gas lease rights to Federal and private lands in south central Washington; they are:

Edwin H. Holcomb
1253 Michelbook Lane
McMinnville, Oregon 97128

Texaco Inc.
3350 Wilshire Blvd.
Los Angeles, CA 90010

R. E. Puckett
215 Security Life Building
Denver, Colorado 80202

David H. Yates
P. O. Box 282
Rhododendron, Oregon 97049

Shell Oil Company
P. O. Box 576
Houston, Texas 77001

The interest generated by the proposed project has generally been low key except where persons and property are directly involved. In those instances the land holders involved are very interested in how the proposed activities would affect their lands and life styles.

X. Persons, Groups and Government Agencies Consulted

In addition to the mailing and press releases discussed in "Intensity of Public Interest", the following agencies, groups and individuals contributed information to the substance of this report.

Federal Agencies:

USDA, Forest Service, Wenatchee Supervisors Office, Wenatchee, WA
Orville Vanderlin, Chief of Lands and Minerals
Daniel Meschter, Mining Engineer
Slim Erickson, Landscape Architect

USDA, Soil Conservation Service, Spokane, WA
Claude C. Dillon, Range Conservation Specialist
Ivan L. Lines, Wildlife Biologist

USDI, Bureau of Reclamation, Ephrata, WA
D.C. Amo, Chief of Land Management Branch
Robert J. Leonard, Conservation Agronomist
Vincent Henry, Realty Specialist

USDI, Bureau of Outdoor Recreation, Seattle, WA
Maurice A. Lundy, Regional Director

USDI, Geological Survey, Water Resources Division, Tacoma, WA
Inquiries Officer

USDI, Geological Survey, Conservation Division, Menlo Park, CA

USDI, Fish and Wildlife Service, Regional Office, Portland, OR
Columbia National Wildlife Refuge, Othello, WA
David Brown, Refuge Manager

USDI, Bonneville Power Administration, Portland, OR
E. Willard, Assistant to Administrator, Interagency Relations

Energy Research and Development Administration, Richland, WA
R. L. Durham, Assistant Manager for Administration
Clyde Fitz, Attorney
E. H. Hess, Chief, Property Management
Norman Fuller, Real Estate Specialist
J. A. Fernandez, Environmental Affairs

U.S. Army, Corps of Engineers, Seattle, WA
District Engineer (for Yakima Firing Center)

Washington State Agencies:

Washington State Highways Commission, Olympia, WA
Russell Albert, Planning Engineer

Washington Department of Game, Olympia, WA
Eugene S. Dziedzic, Assistant Chief Environmental Management Division
Ray Duff, Fishery Biologist
Don Galbreath, Regional Game Biologist
Carol Patzwaldt, Region 2, Administration
Larry Wadkins, Research Project Leader
Delbert Holland, Habitat Development Specialist

Interagency Committee for Outdoor Recreation, Tumwater, WA
Stanley E. Francis, Administrator

State of Washington Department of Natural Resources, Olympia, WA
Donald M. Ford, Deputy Oil & Gas Supervisor, Div. of Geology and Earth Resources

State of Washington Department of Fisheries, Olympia, WA
E. A. LeMier, Senior Biologist

Washington State Advisory Council on Historic Preservation, Olympia, WA
Arthur M. Skolnik, State Conservator

Washington State Park & Recreation Commission, Olympia, WA
David W. Heiser, Chief Environmental Coordinator
David Hansen, Historian

University of Washington, Seattle, WA
Jerry V. Jermann, Public Archaeologist

Washington State University, Pullman, WA
Lester Boyd, Department of Zoology

Central Washington State College, Ellensburg, WA
Department of Geography

County Agencies:

Richard Anderwall, Yakima County Planning Department
William Henager, Grant County Planning Department
G. E. Currier, Property Officer, Grant County Public Utility District, Ephrata, WA

Groups and Individuals:

Sportsman's Council, Inc. Vancouver, WA
W. S. Vickerman, Chairman Big Game Committee

Groups and Individuals (cont.):

Margaret Craig, Seattle, WA

Intermountain Alpine Club, Richland, WA

Palouse Group Sierra Club, Pullman, WA
Randy Neuschwander, Conservation Chairman

Washington Water Power Co., Spokane, WA
K. E. Anderson, Gas Supply Engineer

Cle Elum Chamber of Commerce, Cle Elum, WA
Sandra Morrier, Secretary-Manager

Spokane Audubon Society, M. C. Haggin

XI. Participating Agency Staff

This EAR was prepared by BLM personnel in the Spokane District with assistance from Oregon State Office personnel, Portland, Oregon.

The BLM interdisciplinary team was as follows:

John Benham, Geologist - Spokane District
Raymond Blaisdell, Wildlife Biologist - Spokane District
Ron Doering, Realty Specialist - Spokane District
Dean Finch, Teamleader, Environmental Coordinator - Spokane Office
Bruce Honeyman, Landscape Architect - Oregon State Office
Will Kempe, Realty Specialist - Spokane District
Al Martin, Chief of Resources - Spokane District
Brian McMillen, Outdoor Recreation Planner - Spokane District
Ray Orazem, Natural Resource Specialist - Spokane District

The following BLM Oregon State Office personnel assisted the district personnel in their particular fields.

Dave Luman, Wildlife Management Biologist
Art Oakley, Fisheries Biologist
Ron Russell, Landscape Architect
Don Geary, Planning
Carroll Dubar, Planning
Jack Feuer, Geologist
D. B. Leightner, Minerals Adjudicates
Warren Sandau, Watershed Specialist
Byron Thomas, Soil Scientist

Archeologists Jerry R. Galm and Glenn D. Hartmann, Washington State University, Pullman, Washington, were hired on a short-term appointment to do an extensive survey of the lease application areas for possible historical and archeological values.

XII. Summary Conclusions

Unrestrictive leasing should not be allowed because of the unmitigated impacts that have been brought out in this analysis. Impacts to wildlife, scenic, cultural, and water resources cannot be mitigated in some of the land area with the possibility of full production of an oil or gas field.

There are several reasons why no leasing of any Federal land in the study area is unrealistic:

(1) Adverse impacts on the studied portions of the environment in some areas are slight or easily mitigated.

(2) It is unlikely that all of the Federal lands would be leased. As of February 28 there are numerous tracts of Federal land in Benton, Grant, Kittitas and Yakima Counties on which no lease applications have been received.

If oil or gas is discovered as a result of the proposed leasing there will be beneficial impacts to the counties involved in the form of added employment opportunities, increased business for service oriented businesses, possible building and a resultant increased tax base.

(3) It is unlikely that work beyond the exploration state will happen on the majority of areas that have lease applications. Exploration has the lease environmental impact of the stages of oil and gas development.

INSTRUCTIONS

ENVIRONMENTAL ANALYSIS CHECKLIST

1. Components, sub components and elements impacted are listed in the left hand column.

2. Anticipated Impacts, as they relate to the discrete operation.

   Evaluate anticipated impact on each element and place an entry in the appropriate square indicating degree of impact as low (L), medium (M), high (H), no impact (0), or unknown or negligible (X). Precede each entry by a plus (+) or minus (-) sign indicating a beneficial or adverse type of impact. If type of impact reflects a matter of opinion or is not known, do not proceed with a sign. For example, construction of a wind mill on open range has a definite visual impact; however, to some people the effect is detrimental while to others it is an improvement. By not entering a plus (+) or minus (-) sign the worksheet is kept factual and unbiased.

   a. The measures of impact (e.g., low, medium, and high) are relative and their meaning may vary slightly from action to action. The term "low" should not be applied to impacts of a negligible nature. For example, we know that a pick-up truck driving down a proposed fence line laying wire has some impact on air quality. However, the significance of this impact is not normally great enough to warrant even a "low" rating. In cases like this, the impact will usually be marked "0" or the element left off the worksheet.

   b. It is recognized that some environmental elements may defy accurate measurement or in-depth analysis within current Bureau capabilities or expertise. The nature of the action as well as type and degree of impact should guide in the decision to seek outside expertise or assistance.

3. Remarks - Clarifying information relative to any of the components listed, or those we should address in the analysis report.

ENVIRONMENTAL ANALYSIS CHECKLIST

1. Action - Exploration and Development of Oil & Gas Resource

2. Stage of Implementation - Exploration

3. Discrete Operation

Components, Sub Components and Elements Impacted	Air borne Exploration	Off Road Vehicle Use	Road & Trail Construction	Exploratory Drilling	Rehabilitation	Remarks
	Severity of Impact					
I. NONLIVING COMPONENTS						
A. Air						Light emission of noxious gases and some blowing particulate matter should be expected in road construction, drilling and rehabilitation.
Movement Patterns	O	O	O	O	O	
Temperature	O	O	O	O	O	
Particulate Matter	O	-L/X	-L/X	-L/X	-L/X	
Noxious Gases	O	X	-L/X	-L	-L/X	
Non Ionizing Radiation	O	O	O	O	O	
B. Land						Road use, light road construction and drilling could have light effects, mostly of minus value in nature. The roads might allow for better multiple use of the area.
Soil Depth	O	-L/X	-M	-L/X	+L	
Soil Erosion	O	-L/M	-L/M	-L	+L/M	
Soil Structure	O	-L	-L	-M	+L	
Geologic Structure	O	O	-L/X	X	O	
Land Use Compatability	O	X/L	+L	-L	+L	
Soil Pollutant Prop.	O	O	-L	X	O	
C. Water						If ponds or streams are near the development there would be the potential for water degradation.
Sediment Load	O	-L/M	-L/M	X	-L	
Hydrologic Cycle	O	O	O	X	O	
Dissolved Solids	O	O	O	X	O	
Toxic Chemicals	O	O	O	-L/M	O	
Temperature	O	O	O	O	O	
Dissolved Oxygen	O	O	O	X	O	
Acid Balance (pH)	O	O	O	O	O	

2. Stage of Implementation - Exploration

3. Discrete Operation

Components, Sub Components and Elements Impacted	Air borne Exploration	Off Road Vehicle Use	Road & Trail Construction	Exploratory Drilling	Rehabilitation	Remarks
	Severity of Impact					
II. LIVING COMPONENTS						
A. Plants (aquatic)						
Vascular	0	0	-L	-L	-L	
Phytoplankton	0	0	-L	-L	+L	
Floating	0	0	-L	-L	+L	
B. Plants (terrestrial)						
Lichens and Mosses	0	-L	-M/-H	-L	0	Impact localized, road construction would adversely affect plant life.
Grasses	0	-L	-M/-H	-L	+L	
Forbes	0	-L	-M/-H	-L	+L	
Shrubs	0	-L	-M/-H	-L	X	
Conifers	X	X	X	X	X	
Broadleaf Trees	X	X	X	X	X	
C. Animals (aquatic)						
Fish	0	X	X/-L	X	+L	
Mammals	0	-L	-L	-L	+M	
Birds	0	-L	-L	-L	+L	
Amphibians & Reptiles	0	-M	-M	-L	+M	
Invertebrates	0	X	-L	X	+L	
Zooplankton	X	X	X	X	X	
D. Animals (terrestrial)						
Mammals	0	-L	-M	-L	+L	
Birds	0	-L	-L	-L	+L	
Amphibians & Reptiles	0	-M	-L	X	X	
Invertebrates	0	-L	-L	X	+L	
Man	+L	+L	+M	+M	+M	

2. Stage of Implementation - Exploration

3. Discrete Operation

Components, Sub Components and Elements Impacted	Air borne Exploration	Off Road Vehicle Use	Road & Trail Construction	Exploratory Drilling	Rehabilitation	Remarks
	Severity of Impact					
III. ECOLOGICAL INTERRELATIONSHIPS						
A. Ecological Processes (Plant)						
Succession	O	O	-M/-H	-L	+L	
Food Relationships	O	O	-L	-L	+L	
Community Relationships	O	O	-L	-L	+L	
IV. HUMAN VALUES						
A. Landscape Character						Impact would be high in scenic areas such as Yakima Canyon if drilling is conducted.
Major Theme	O	X	-L/-M	-M	+L/+M	
Harmonious Element	O	-L	-L/-M	-M	+M	
Accentuating Element	O	X	X	X	X	
B. Sociocultural Interests						Exploratory drilling would add to geologic information, drilling and roads would disturb natural values.
1. Educational - Scientific						
Geological-Paleontological	O	X	-L/-M	L	X	
Ecological	O	-L	-M/-H	-M/-H	L	
Hydrological	O	-L	-L	-L	X	
2. Historical						Drilling & roads would disturb natural values.
Archeological	O	X	-L	-L	+L	
3. Cultural Values	O	X	-L/-M	-L	+L	Drilling & roads would disturb natural values.
4. Recreation						
Recreation Resources	O	M	-M	-L/-M	+M	Natural quality of recreation resources may be disturbed , improved access could be both favorable & detrimental.
Developed Sites	O	L	X	-M	+M	
Public Access	O	M	M/H	M	H	

2. Stage of Implementation - Exploration

3. Discrete Operation

Components, Sub Components and Elements Impacted	Air borne Exploration	Off Road Vehicle Use	Road & Trail Construction	Exploratory Drilling	Rehabilitation	Remarks
	Severity of Impact					
IV. HUMAN VALUES						
B. Sociocultural Interests						Small temporary increases in exploratory phase, may put added pressures on social services. Attitudes may depend on actions and mitigations taken.
5. Social Welfare						
Population	O	O	L	L	X	
Employment Industry	O	O	+L	+L/-M	X	
Social Service	O	O	L	L	X	
Attitudes & Expectations	O	X	L	L	M	
Local Regulatory Structures	O	O	L	L	M	

1. Action - Exploration and Development of Oil & Gas Resource

2. Stage of Implementation - Development

3. Discrete Operation

Components, Sub Components & Elements Impacted	Severity of Impact: Road Construction	Drill Site Development	Plant Construction	Rehabilitation		Remarks
I. NONLIVING COMPONENTS						Road construction, drilling and plant construction would degrade the atmosphere during the actual phase under development, should be temporary in nature.
A. Air						
Air Movement	0	0	0	0		
Temperature	0/x	0/x	0/x	0		
Particulate Matter	-L/-M	-L/-M	-L/-M	-L		
Noxious Gases	-L/-M	-L/-M	-L/-M	-L		
Nonionizing Radiation	0	0	0	0		
B. Land						Development activities such as road construction, drill site development and plant construction will have a minus effect for the duration of the project.
Soil Depth	-L/-M	-L	-L	+L		
Soil Erosion	-L/-M	-L	-L	+L/+M		
Soil Structure	-M	-L	-L	+L		
Geologic Structure	0	0	0	0		
Land Use Compatability	0/+L	-L	-M	+L		
Soil Pollutant Properties	0/-L	-L	-L/-M	+L		
C. Water						If ponds or streams are near the development there would be a potential for degradation of the water thru the drilling, construction and production phases.
Sediment Load	-L/-M	-L	-L/-M	+L		
Hydrologic Cycle	-L/-M	-L	-L	+L		
Dissolved Solids	-L/x	-L/x	-L	+L		
Toxic Chemicals	0/x	x/-L	x/-L	+L		
Temperature	0	0	x/-L	0		
Dissolved Oxygen	x/-L	x/-L	x/-L	+L		
Acid Balance (pH)	x/-L	x/-L	x	x		

2. Stage of Implementation - Development

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impacts: Road Construction	Drill Site Development	Plant Construction	Rehabilitation	Remarks
II. LIVING COMPONENTS					
A. Plants (aquatic)					Road construction would likely cause sediment in water bodies.
Vascular	-L	-L	-L	+L	
Phytoplankton	-L	-L	-L	+L	
Floating	-L	-L	-L	+L	
B. Plants (terrestrial)					Road and facility construction would take limited areas out of production during life of the project.
Lichens & Mosses	-M/-H	-H	-H	+L/+M	
Grasses	-M/-H	-H	-H	+L/+M	
Forbs	-M/-H	-H	-H	+L/+M	
Shrubs	-M/-H	-H	-H	+L/+M	
Conifers	X	X	X	X	
Broadleaf Trees	X	X	X	X	
C. Animals (aquatic)					Road construction would likely cause sediment in water bodies.
Fish	X/-L	X/-L	-L/-M	X/+L	
Mammals	-L	-L	-L/-M	+L	
Birds	-L	-L	-L	+L	
Amphibian & Reptiles	-L	-L	-L	+L	
Invertebrates	-L	X	-L/-M	+L	
Zooplankton	X	X	X	X	
D. Animals (terrestrial)					Road & facility construction would displace small animals and disrupt habits of larger animals.
Mammals	-L	-L/-M	-L/-M	+L/+M	
Birds	-L	-L	-L	+L	
Amphibians & Reptiles	-L	-L	-L	+L	
Invertebrates	-L	-L	-L	+L	
Man	L/M	X/M	X/M	L/M	

2. Stage of Implementation - Development

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impacts: Road Construction	Drill Site Development	Plant Construction	Rehabilitation	Remarks
III. ECOLOGICAL INTERRELATIONSHIPS					
A. Ecological Processes (Plant)					Would have a detrimental effect for the life of the project.
Succession	-M/-H	-H	-H	+L/+M	
Food Relationships	-L/-M	-L	-L	+L	
Community Relationships	-L/-M	-L	-L	+L	
IV. HUMAN VALUES					
A. Landscape Character					Impacts would increase with intensity of development.
Major Theme	L	L/M	M	M	
Harmonious Element	-L/-M	-L/-M	-M	+M	
Accentuating Element	X	X	X	X	
B. Sociocultural Interests					Scientific values may be disturbed or lost.
1. Educational - Scientific					
Geological-Paleontological	-L/-M	-L/-M	-L/-H	X	
Ecological	-L/-M	-L/-M	-M	+L	
Hydrological	-L	-L/-M	-M	+L	
2. Historical	-L/-M	-L	-L	+L	Scientific values may be disturbed or lost.
Archeological	-M/-H	-L/-M	-L/-H	X	
3. Cultural Values	-L	-L	-L	+L	

2. Stage of Implementation - Development

3. Discrete Operation

Components, Sub Components & Elements Impacted	Severity of Impact: Road Construction	Drill Site Development	Plant Construction	Rehabilitation	Remarks
IV. HUMAN VALUES					
B. Sociocultural Interests					
4. Recreation Values					Public access may be increased or decreased.
Recreation Resources	-M	-M	-M	+M	
Developed Sites	X/-L	-M	-M	+M	
Public Access	M/H	M	M	M/H	
5. Social Welfare					
Population	L	M	M	L	
Employment - Industry	+L/+M	+M/+H	+M/+H	M	
Social Services	L	L	L	L	
Attitudes and Expectations	L	L	L/M	L	
Local Regulatory	L	L	L	L	

1. Action - Exploration and Development of Oil and Gas Resource

2. Stage of Implementation - Operation

3. Discrete Operation

Components, Sub Components and Elements Impacted	New Drill Sites	Maintenance	Waste Disposal	Production	Rehabilitation	Remarks
	Severity of Impact					
I. NONLIVING COMPONENTS						
A. Air						New drill site, waste disposal and production have the potential to degrade the atmosphere.
Air Movement Patterns	O	O	O	O	O	
Temperature	O	X	X/-L	X/-L	O	
Particulate Matter	-L/-M	X	X/-L	-L/-M	-L	
Noxious Gases	-L/-M	X	-L/-M	-L/-M	-L	
Nonionizing Radiation	O	O	O	O	O	
B. Land						Operation activities could have a light minus effect during the life of the project.
Soil Depth	-L	O	O	O	+L	
Soil Erosion	-L	O	O	X/-L	+L/+M	
Soil Structure	-L	O	O	-L/-M	+L	
Geologic Structure	X/-L	O	O	X	O	
Land Use Compatability	-L/-M	O	-L	-L/-M	+L	
Soil Pollutant Properties	X/-L	O	-L/X	X/-L	+L	
C. Water						If near ponds or streams accidental spills would be a constant threat to water bodies.
Sediment Load	X/-L	O	X/-L	-L/-H	+L	
Hydrologic Cycle	X	O	X/-L	-L	+L	
Dissolved Solids	X/-L	O	-L/-M	-L/-M	+L	
Toxic Chemicals	X/-L	O	-L/-M	-L/-H	+L	
Temperature	X	O	X	-L/X	O	
Dissolved Oxygen	O	O	X	X	+L	
Acid Balance (pH)	X	O	X	X	X	

2. Stage of Implementation - Operation

3. Discrete Operation

Components, Sub Components and Elements Impacted	New Drill Sites	Maintenance	Waste Disposal	Production	Rehabilitation	Remarks
	Severity of Impact					
II. LIVING COMPONENTS						
A. Plants (aquatic)						
Vascular	-L	O	-L	X	+L	
Phytaplankton	-L	O	-L	X	+L	
Floating	-L	O	-L	X	+L	
B. Plants (terrestrial)						
Lichens & Mosses	-M/-H	O	-M/-H	X	+L/+M	
Grasses	-M/-H	O	-M/-H	X	+M	
Forbs	-M/-H	O	-M/-H	X	+M	
Shrubs	-M/-H	O	-M/-H	X	+M	
Conifers	-L/-M	O	-L/-M	X	+L/+M	
Broadleaf Trees	-L/-M	O	-L/-M	X	+L/+M	
C. Animals (aquatic)						Water contamination from spills and production is possible.
Fish	X/-L	O	-M/-H	X	+L/+M	
Mammals	-L	L	-M	-M	+M/+H	
Birds	-L	X	-M/-H	-M	+M/+H	
Amphibians & Reptiles	-L	X	-M/-H	-M	+M	
Invertebrates	-L	X	-L/-M	-L	+M/+H	
Zooplankton	X	X	-M/-H	-M	+M	
D. Animals (terrestrial)						Would displace animals until removed, spills may endanger animals.
Mammals	-L	X	-M	-M	+M	
Birds	-L	X	-M	-M	+M	
Amphibians & Reptiles	-M	X	-M	-M	+M	
Invertebrates	X	X	X	X	X	
Man	M/H	L	-M	H	M	

2. Stage of Implementation - Operation

3. Discrete Operation

Components, Sub Components and Elements Impacted	New Drill Sites	Maintenance	Waste Disposal	Production	Rehabilitation	Remarks
	Severity of Impacts					
III. ECOLOGICAL INTERRELATIONSHIPS						
A. Ecological Processes (Plant)						
Succession	-M/-H	O	-M/-H	X	+L/+M	
Food Relationship	-L/-M	O	-M/-H	X	+L	
Community Relationship	-L/-M	O	-M/-H	X	+L	
IV. HUMAN VALUES						The effects of the development would vary in the eyes of the individual according to his needs.
A. Landscape Character						
Major Theme	-M	X	-L/-M	M	M	
Harmonious Element	-M	X	-M	-M	+M	
Accentuating Element	X/-L	X	X/-L	L	L	
B. Socio-Cultural Interests						Scientific values could be degraded, waste disposal could degrade water and environmental quality.
1. Educational-Scientific						
Geological-Paleontolgical	-L	X	-L	X/-L	L	
Ecological	-L/-M	X	-M/-H	-L	+L	
Hydrological	-L/-M	X	-M	-L	+L	
2. Historical	-L/-M	X	-L	X	L	Could be detrimental to sites not yet discovered.
Archeological	-M	X	-M/-H	X	M	
3. Cultural Values	L	X	X	X	L	

2. Stage of Implementation - Operation

3. Discrete Operation

Components, Sub Components and Elements Impacted	New Drill Sites	Maintenance	Waste Disposal	Production	Rehabilitation	Remarks
	Severity of Impact					
B. Sociocultural Interests						
4. Recreation						Has potential to degrade recreational use of water and developed sites, may improve access potential.
Recreation Resources	-M	X	-M	-L	+M	
Developed Sites	-M	X	-M	-L	+M	
Public Access	M	X	-L/-M	X	M	
5. Social Welfare						Would provide opportunities for jobs, improve social services.
Population	+M	L	X	M	X	
Employment - Industry	+M	L	X	M	L	
Social Services	M	L	X	M	L	
Attitudes and Expectations	L/M	+M	-M/-H	M/H	+L/+M	The needs of the individual would determine how he or she views the project.
Local Regulatory Structure	L	+L	-L/-M	M/H	L	

1. Action - Exploration and Development of Oil & Gas Resource

2. Stage of Implementation - Close Out

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impact: Removal of Surface Equip.	Capping Drill Holes & Wells	Surface Rehabilitation	Site Return To Surface Owner	Remarks
I. NONLIVING COMPONENTS					
A. Air					Close out would have both + and - values for long run, minus values for short run.
Air Movement Patterns	0	0	0	0	
Temperature	0	0	0	0	
Particulate Matter	-L/-M	X	-L	0	
Noxious Gases	-L	X/+L	-L	0	
Nonionizing Radiation	0	0	0	0	
B. Land					Close out would have both + and - values for long run, minus values for short run.
Soil Depth	X/-L	X	+L	0	
Soil Erosion	-L/-M	X	+L/+M	0	
Soil Structure	-L	X	+L	0	
Geologic Structure	X	X	X	0	
Land Use Compatability	+L	+L	+L/+M	0	
Soil Pollutant Properties	-L	X	X	0	
C. Water					Close out would have both + and - values for long run, minus values for short run.
Sediment Load	-L/-M	0	-L	0	
Hydrologic Cycle	-L	0	X	0	
Dissolved Solids	X/-L	X	X/-L	0	
Toxic Chemicals	X/-L	X	X/-L	0	
Temperature	X	0	0	0	
Dissolved Oxygen	X	0	0	0	
Acid Balance (pH)	X	X	0	0	

2. Stage of Implementation - Close Out

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impact: Removal of Surface Equip.	Capping Drill Holes & Wells	Surface Rehabilitation	Site Return To Surface Owner	Remarks
II. LIVING COMPONENTS					
A. Plants (aquatic)					Disturbing the soil would likely release sediment during the life of the activity.
Vascular	O	O	L	O	
Phytoplankton	O	O	L	O	
Floating	O	O	L	O	
B. Plants (terrestrial)					Disturbing the soil would likely release sediment during the life of the activity.
Lichens and Mosses	X	O	L	O	
Grasses	X/+L	X/L	+L	O	
Forbs	X/+L	X/L	+L	O	
Shrubs	X/+L	X/L	+L	O	
Conifers	X	X	X	O	
Broad Leaf Trees	X	X	X	O	
C. Animals (aquatic)					
Fish	X/+L	X	+L/+M	O	
Mammals	+M	+L/+M	+L/+M	O	
Birds	+L/+M	+L/+M	+L/+M	O	
Amphibians & Reptiles	+L/+M	+L/+M	+L/+M	O	
Invertebrates	X	X	+M	O	
Zooplankton	O	X	X	O	
D. Animals (terrestrial)					
Mammals	+L	X	+M	O	
Birds	+M	X	+M	O	
Amphibians & Reptiles	+M	X	+M	O	
Invertebrates	+L	X	+M	O	
Man	+M	M	M	+M	

2. Stage of Implementation - Close Out

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impact: Removal of Surface Equip.	Capping Drill Holes & Wells	Surface Rehabilitation	Site Return To Surface Owner	Remarks
III. ECOLOGICAL INTERRELATIONSHIPS					
A. Ecological Processes (Plant)					
Succession	X/+L	X	+L	O	
Food Relationships	X/+L	X	+L	O	
Community Relationships	X/+L	X	+L	O	
IV. HUMAN VALUES					
A. Landscape Character					Surface rehabilitation would likely improve visual resource quality
Major Theme	+M	X	+L/+M	X	
Harmonious Element	+M	X	+H	X	
Accentuating Element	X/+L	X	X	X	
B. Sociocultural Interests					
1. Education - Scientific					
Geological - Paleontological	+L	O	+L	+L/+M	
Ecological	X	O	+L	+L	
Hydrological	X	O	X/+L	X/+L	
2. Historical	+L	X	+L	X/+L	
Archeological	X/+L	X	X/+L	X/+L	
3. Cultural Values	+L	O	+L	X	
4. Recreation					Recreation resources should improve, except for primitive values which might decline.
Recreation Resource	+M	O	+M	+M	
Developed Sites	+M	O	+M	X/+L	
Public Access	X	O	X/+L	H	

2. Stage of Implementation - Close Out

3. Discrete Operation

Components, Sub Components and Elements Impacted	Severity of Impact: Removal of Surface Equip.	Capping Drill Holes & Wells	Surface Rehabilitation	Site Return To Surface Owner	Remarks
IV. HUMAN VALUES					
B. Sociocultural Interests					
5. Social Welfare					Employment may be lost, some outmitigation could develop, social services will be reduced.
Population	-M	-M	X	O	
Employment-Industry	-M/-H	-M	X/-L	O	
Social Services	X/-L	X	X	O	
Attitudes & Expectations	X/L	O	H	M	Would vary according to personal outlook.
Local Regulatory Structure	X/L	O	H	M	

APPENDIX

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A P P E N D I X
Section - A

REFERENCES CITED

Vegetation & Ecological Relationships

Air Pollution Control Association, Recognition of Air Pollution Injury to Vegetation: A Pictorial Atlas, Pittsburg, PA, 1970.

Daubenmire, R., Forest Vegetation of Northern Idaho and Adjacent Washington and its Bearing on Concepts of Vegetation Classification, 1952.

Environmental Protection Agency, Freshwater Biology and Pollution Ecology, Training Manual, June 1971.

Franklin, Jerry F., and Dyrness, C. T., Vegetation of Oregon and Washington, U.S.D.A. Forest Service Research Paper, PNW-80, Portland, Oregon, 1969.

Interstate Oil Compact Commission, Water Problems Associated With Oil Production in the United States, Oklahoma City, Oklahoma, 1965.

Montgomery, Edwin H. and McGowan, Terry A., 1971, The Environmental Impact of Oil and Gas Development on Public Lands, Paper No. EQC45 Prepared for Extractive Industries of the American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York, NY, June 1971.

National Petroleum Council, 1971, Environmental Conservation - The Oil and Gas Industries, Volume One, Prepared by the Council's Committee on Environmental Conservation at the Request of the Department of the Interior, 106 pp., Illus., Washington, D.C., June 1971.

Odum, Eugene P., 1959, Fundamentals of Ecology, W. B. Saunder Co., Philadelphia, PA, pp. 546, Illus.

Thomas, Byron R., Tractor Logging and Soil Compaction, A Review of Available Information, A Report to State Director, Oregon, BLM, 1970.

U.S. Forest Service, Southeastern Area, Air Pollution and Trees, Atlanta, Georgia, 1971.

Animal Related

Burt, William Henry, A Field Guide to the Mammals, 1964.

Calhoun, Alex, Department of Fish and Game, State of California, 1966, Inland Fisheries Management, p. 546.

Harris, Stanley W., and Yocom, Charles F., "Birds of the Lower Grand Coulee and Potholes Area, Grant County, Washington".

Martin, Zim, Nelson, 1961, American Wildlife and Plants: A Guide to Wildlife Feed Habits, Dover Publications Inc., New York, 500 pp.

Pacific N.W. River Basin Commission, pgs. 29-43, (Bailey, 1936).

Peterson, Rodger Tory, 1961, A Field Guide to Western Birds, Houghton Mifflin Company, Boston, 366 pp.

Stebbins, Robert C., 1966, A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Company, Boston, 279 pp.

Washington Game Department, "L.T. Murray Wildlife Recreation Area (High Valley)", by Wendell H. Oliver.

The pamphlets put out by the Washington State Department of Game which cover areas within or adjacent to the proposed oil and gas lease areas are the following wildlife recreation areas: Oak Creek WRA, L.T. Murray WRA, Crab Creek WRA, Colockum WRA and Desert Potholes.

The Fish and Wildlife Service has pamphlets on "Birds of the Columbia National Wildlife Refuge", and "Columbia National Wildlife Refuge Fishing".

The Spokane Audubon Society has a "Daily Field Card - Birds of Eastern Washington" which can be obtained which lists the birds which may be seen and during which season for eastern Washington.

Sociocultural Interests

Daugherty, Dr. Richard D., The Yakima People, Indian Tribal Series, Library of Congress Catalog No. 73-80707, 1973.

Dyrness, C. T., et.al., Research Natural Area Needs in the Pacific Northwest, U.S.D.A. Forest Service General Technical Report PNW-38, Portland, Oregon, 1975.

Grant County, Overall Economic Development Program, Grant County Planning Department, Ephrata, Washington, 1975.

Interagency Committee for Outdoor Recreation, Washington Statewide Comprehensive Outdoor Recreation and Open Space Plan, Volume One and Volume Two; Tumwater, Washington, 1973.

Interagency Committee for Outdoor Recreation, Washington State Recreation Trails Program, Tumwater, Washington, 1974.

Washington Public Power Supply System, WPPSS Nuclear Project No. 1, Volume One and Application for Washington State Site Certification, Richland, Washington, 1974.

Washington State Parks and Recreation, et.al., The Yakima Canyon Scenic and Recreational Highway, Olympia, Washington, 1968.

Yakima-Kittitas Counties, Yakima-Kittitas Resource Conservation and Development Project Plan, U.S.D.A. Soil Conservation Service, Spokane, Washington, 1974.

Petroleum Related

Braislin, D. B.; and others, 1971, Petroleum potential of western Oregon and Washington and adjacent continental margin: American Association of Petroleum Geologists Memoir 15, p. 229-238.

Felts, W. M., 1954, Occurrence of oil and gas and its relation to possible source beds in continental Tertiary of Intermountain region: American Association of Petroleum Geologists Bulletin, v. 38, no. 8, p. 1661-1670.

Glover, S. L., 1935, Oil and gas possibilities of western Whatcom County: Washington Division of Geology Report of Investigations 2, 69 p.

Glover, S. L., 1936, Preliminary report on petroleum and natural gas in Washington: Washington Division of Geology Report of Investigations 4, 24 p.

Glover, S. L., 1947, Oil and gas exploration in Washington: Washington Division of Mines and Geology Information Circular 15, 59 p.

Gower, H. D.; Wanek, A. A., 1963, Preliminary geologic map of the Cumberland guadrangle, King County, Washington: Washington Division of Mines and Geology Geologic Map GM-2.

Grolier & Bingham, Geologic Map and Sections of Parts of Grant, Adams and Franklin Counties, Washington, Miscellaneous Geologic Investigations Map I-589, U.S.D.I. Geologic Survey.

Hammer, A. A., 1934, Rattlesnake Hills gas field, Benton County, Washington: American Association of Petroleum Geologists Bulletin, v. 18, no. 7, p. 847-859.

Kirkham, V. R. D., 1935, Natural gas in Washington, Idaho, eastern Oregon, and northern Utah. In geology of natural gas: American Association of Petroleum Geologists, p. 221-244.

Livingston, V. E., Jr., 1958, Oil and gas exploration in Washington 1900-1957: Washington Division of Mines and Geology Information Circular 29.

Livingston, V. E., Jr., 1969, Geologic History and Rocks and Minerals of Washington, State of Washington, Department of Natural Resources, Information circular #45.

Livingston, V. E., Jr., 1974, Energy Resources of Washington, State of Washington Department of Natural Resources, Division of Geology and Earth Resources, Information Circular 50, p. 67-81.

Lupton, C. T., 1915, Oil and gas in the western part of the Olympic Peninsula, Washington: U. S. Geological Survey Bulletin 581, p. 23-81.

McLean, J. G., 1973, Guide to National Petroleum Council Report on United States energy outlook (Presentation made to National Petroleum Council, December 11, 1972, by John G. McLean and Warren B. Davis): National Petroleum Council, Washington, D.C., 40 p.

Newcomb, R. C., Tetonic Structure of the Main Part of the Basalt of the Columbia River Group for Washington, Oregon and Idaho, Miscellaneous Geologic Investigations Map I-587, U.S.D.I. Geologic Survey.

Popenoe, H. L., 1959, Developments in West Coast area in 1958: American Association of Petroleum Geologists Bulletin, V. 43, no. 6, p. 1389-1405.

Snavely, P. D., Jr.; and others, 1958, Geology and coal resources of the Centralia-Chehalis district, Washington, with a section on microscopical character of Centralia-Chehalis coal by J. M. Schopf: U. S. Geological Survey Bulletin 1053, 159 p.

United States Geological Survey; and others, 1966, Mineral and water resources of Washington: Washington Division of Mines and Geology Reprint 9; Committee Print of the 89th U.S. Congress, 2d Session, 436 p.

Vine, J. D., 1962, Preliminary geologic map of the Robart and Maple Valley quadrangles, King County, Washington: Washington Division of Mines and Geology Geologic Map GM-1.

Weaver, C. E., 1915, The possible occurrence of oil and gas fields in Washington: American Institute of Mining Engineers Bulletin 103, p. 1419-1427.

Weaver, C. E., 1916, The Tertiary formations of western Washington: Washington Geological Survey Bulletin 13, 327 p.

Weaver, C. E., 1933, Geology and its relation to the occurrence of oil in Washington: University of Washington Engineering Experiment Station Series Bulletin 98, 16 p.

Weaver C. E., 1945, Geology of Oregon and Washington and its relation to occurrence of oil and gas: American Association of Petroleum Geologists Bulletin, v. 29, no. 10, p. 1377-1415.

General References

A Guide to Water Research Information Sources in the State of Washington, Water Research Center, Washington State University and the University of Washington, Pullman, Washington, June 1973 Report #16.

Climatological Handbook, Columbia Basin States June 1969, Meteorology Committee, Pacific Northwest River Basins Commission Volume I, part A and B, Volume II and Volume III, part A and B.

Columbia Basin Project, Draft Environmental Statement, Department of Interior, Bureau of Reclamation, Ephrata, Washington, January 1975, Rodney J. Vissia, Regional Director.

Gladwell, John; Hastay, Millard, et.al.; Johnson, Ralph: The Columbia River as a Resource, State of Washington Water Research Center, Washington State University and University of Washington, June 1971, Pullman, Washington.

Pacific Northwest River Basins Commission, 1970, Columbia-North Pacific Region Comprehensive Framework Study, Appendix IV, Volume 1, Appendix V, Volume 1, Appendix VI, Appendix VIII, Volume 1 and Appendix XII.

State of Washington Water Quality Standards and Definitions, Chapter 372-12, Interstate Water Quality Standards and Chapter 372-64, Intrastate Water Quality Standards, Supp. #5 (5/1/70) Washington Administrative Code.

U.S.D.I., Geological Survey, Water Resources Data for Washington - Part 2. Water Quality Records, 1970; prepared in cooperation with the State of Washington and other agencies.

A P P E N D I X
Section - B

USFS REGION 6 LETTER OF TRANSMITTAL
SUPPLEMENTAL STIPULATIONS
WENATCHEE NATIONAL FOREST RECOMMENDATION
WENATCHEE NATIONAL FOREST DRAFT EAR

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Region 6
P.O. Box 3623, Portland, Oregon 97208

2820

February 25, 1976

H&B
2-27-76

Mr. Harold A. Berends
Chief, Branch of Lands and
Minerals Operations
Bureau of Land Management
P.O. Box 2965
Portland, Oregon 97208

Your ref.: OR 13434 etc.
(3111A)

Dear Mr. Berends:

We are enclosing a copy of a memo from the Wenatchee National Forest dated February 12 with comments, recommendations, and stipulations in regard to the above-designated oil and gas lease applications. We concur with the recommendations.

A draft Environmental Analysis Report is also submitted.

If you need additional information, please advise.

Sincerely,

Robert H. Torkelson

for T. A. SCHLAPFER
Regional Forester

Enclosures

STATE OFFICE
PORTLAND, OREGON
RECEIVED
FEB 27 10 00 AM '76
BUREAU OF
LAND MANAGEMENT

STATE OFFICE
PORTLAND, OREGON
FEB 27 10 00 AM '76

6200-11 (1/69)

SUPPLEMENTAL STIPULATIONS TO STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE

To be attached to and made a part of Form 3109-3.

(a) At least two weeks before beginning of any clearing, construction, or operations, including access and work road location and construction, the lessee shall prepare a "Lessee Surface Management Operation Plan" with the District Ranger.

The final plan shall be prepared in triplicate, including maps, for the approval by the Forest Supervisor. Such approval will be conditioned on reasonable requirements needed to prevent soil erosion, water pollution and unnecessary damages to the surface vegetation and other resources of the United States and to provide for the restoration of the land surface and vegetation. The plan shall contain all such provisions as the Forest Service may deem necessary to maintain proper management of the lands and resources within the operating area.

Where appropriate, depending upon the location and type of operation, the Forest Supervisor may require the plan to contain, at a minimum, the following items:

1. The location, construction specifications, maintenance program and estimated use by the lessee, his employees and agents, of all access and work roads.

2. The exact location and extent of any and all areas to be occupied during the operations.

3. The methods to be used in the operations, including disposal of waste material.

4. The size and type of equipment to be used in the operation.

5. The capacity, size, character, standards of construction and location of all structures and facilities to be constructed.

6. Typical profiles of cuts and fills of all areas to be graded for the installation of structures and facilities.

7. The location and size of areas upon which vegetation will be destroyed and/or soil laid bare and the steps which will be taken to prevent and control soil erosion thereon,

including but not limited to the proposed program for rehabilitation and revegetation of these disturbed lands both during and upon cessation of operations.

8. The steps which will be taken to prevent water pollution.

9. The character, amount, and time of use of explosives or fire, including safety precautions which will be taken during their use.

10. Forest user, permitted livestock and wildlife protection.

If later operations require departure from or additions to the approved plan, these revisions or amendments, together with justification statement for proposed revisions, will be submitted to the District Ranger for approval of the Forest Supervisor.

Any and all operations conducted in advance of approval of an original, revised or amended operating plan, or which are not in accord with an approved plan, constitute a violation of the terms of this lease and the Forest Service reserves the right to close down the operation until such corrective action, as is deemed necessary, is taken by the lessee.

(b) (1) To guarantee the successful rehabilitation and revegetation of abandoned operating areas, as provided for in the "Lessee Surface Management Operating Plan," paragraph (a) above, the Forest Service is agreeable to the reduction of lease or operator bonds to an amount necessary to cover the estimated cost of rehabilitation and revegetation, providing that the lessee has otherwise satisfied the conditions of this lease and the United States Geological Survey and the Bureau of Land Management have approved such a reduction.

(2) In lieu of bond, the lessee may upon mutual agreement with the Forest Supervisor deposit cooperative funds sufficient to cover the cost of rehabilitating and revegetation abandoned operating areas. When such funds have been deposited, the Forest Supervisor shall notify the United States Geological Survey that the requirements of the Forest Service have been satisfied, providing that all other conditions of the lease which concern the Forest Service have been satisfied.

(c) Notwithstanding any provision of this lease to the contrary, any clearing, use, or other operation on the leased lands that will disturb the surface thereof or otherwise affect the environment, hereinafter called "surface disturbing operation," conducted by lessee shall be subject as set forth in this stipulation, to prior approval of such operation by the United States Geological

Survey in consultation with appropriate Surface Management Agency and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the Geological survey may require to protect the surface of the leased lands and the environment.

(d) No occupancy of the surface of the following areas is authorized by this lease. The lessee is, however, authorized to employ directional drilling to develop the mineral resources under these areas provided that such drilling or other work will not disturb the surface area or otherwise interfere with their use by the Forest Service. It is understood and agreed that the use of these areas for National Forest purposes is superior to any other use. Directional drilling under specified no-occupancy areas will be permitted only from other lands included in this lease or from oil and gas leases or jurisdictions on other lands. Areas to be excluded from direct drilling occupancy are:

(1) Within 500 feet on either side of the centerline of any and all roads and/or highways within the lease areas.

(2) Within 200 feet on either side of the centerline of any and all trails within the lease area.

(3) Within 500 feet of the normal highwater line of any and all lakes, ponds and reservoirs located within the lease area.

(4) Within 500 feet of the normal highwater line of any and all streams in the area.

The distances in subparagraphs 1, 2, 3 and 4 immediately above may be reduced when specifically agreed to in the operating plan. See paragraph (a).

(5) Within 400 feet of any and all springs within the lease area.

(6) Within 400 feet of any improvement either owned, permitted, leased or otherwise authorized by the Forest Service.

(7)

(e) The lessee shall provide a complete inventory, evaluation and report of archaeological and historical values on lands to be disturbed or occupied. This will be prepared by an archaeologist, acceptable to the authorized Forest Officer in advance of any surface disturbance or occupancy.

FOREST SERVICE

Wenatchee National Forest
Box 811, Wenatchee, WA 98801

RECEIVED
FEB 19 1976
LAND & MINERALS

REPLY TO: 2820 Leases and Permits

February 12, 1976

SUBJECT: Oil and Gas Leases, Shell Oil, et. al., OR-13434, 13443, 13445, 13455, 13463, 13464, 13467, 13571, 13572, 13584 to 13593, 13679 and 13680

TO: Regional Forester

Attached is a copy of the Forest Service's input for the environmental analysis report being prepared by the Bureau of Land Management for proposed oil and gas leasing in the Yakima basin.

The District Rangers conclude that no special stipulations will be required to be included in individual leases.

I recommend oil and gas leasing on the lands described in the captioned applications, to the extent the lands are under the jurisdiction of the Department of Agriculture, subject to Bureau of Land Management standard stipulations Forms 3109-3 and 3109-5 and the Supplemental Stipulations to Stipulation for Lands under Jurisdiction of Department of Agriculture attached.

RICHARD F. BUSCHER
Assistant Forest Supervisor
Resource

ENVIRONMENTAL ANALYSIS REPORT

DRAFT

OIL LEASE APPLICATIONS ON:

TIETON R. D.

NACHES R. D.

ELLENSBURG R. D.

1/16/76

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Non-living Components

1. Air

a. Air Movement Patterns

The prevailing winds are westerly. There is a period in the late summer when easterly winds can be anticipated. The areas are mountainous and timbered so wind velocities near the ground are usually low, ridgetops being the exception.

b. Temperature

The frost-free period can vary from 30 to 90 days with an average of 60 days. The summer minimum temperatures ranges from 40° to 60° while the summer maximum temperatures range from 60° to 80° with an occasional extreme maximum of 100°. Winter temperatures run from 0° to plus 20° with extremes of -25° or +40°.

c. Particulate Matter

There is very little solid particulate in the spring and summer with normal west winds unless there are forest fires. The soils are stable and present little opportunity for wind erosion to produce particulate matter.

d. Carbon Monoxide

The present carbon monoxide levels are low as the areas have good air drainage with only minor combustion sources except for forest fires.

e. Hydrocarbons

The present hydrocarbon levels are low for the same reasons as for carbon monoxide.

f. Nitrogen Oxides

The present nitrogen oxide levels are low for the same reasons as for carbon monoxide.

g. Sulphur Oxides

There are no industrial plants emitting sulphur oxide gases in the area at present.

h. Radiological Contaminants

There are no known uranium deposits in this area.

i. Non-ionizing Radiation

There are no power transmission lines or radio stations near enough to the area to contaminate them.

2. Land

a. Soil Depth

The mountainous area conprising the area with which we are dealing was formed through volcanic action. Soils are chiefly shallow to deep, stony and broken by outcrops of the underlying rock. The soils formed in glacial till and outwash or residual materials. The bedrock of the survey area is composed of the following major types of rocks: andesites and basalts, pyroclastics, sedimentary (both marine and non-marine), granitic and schist. Of these the most predominate rocks are the andesites, basalts and pyroclastics. These rocks occur both separately and intermixed and constitute over 70% of the area. The remaining area is approximately equally divided among the other rock types with the exception of the schist rocks which are of very minor extent.

The soils of the area are shallow to moderately deep residual and alluvial types. These soils characteristically exhibit little orthological development, are generally shallow to moderately deep (2 to 5 feet), weakly structured, well drained, gravelly, medium to moderately coarse textured and are derived from a wide variety of hard and moderately hard rock types, including volcanics, sedimentary and granitics.

b. Soil Structure

Most of the area has received volcanic ash influence in recent geologic history as indicated by a thin layer of surface ash or ash incorporated with the surface soil layers. Unincorporated ash layers range in thickness from 0 to 6 inches. The ash ranges in texture from sand to sandy loam and ranges in color from gray to dark yellowish brown.

c. Soil Nutrients

The nutrient contents of this area is not adequate for agricultural crops but does produce well-stocked timber stands of Douglas fir, western larch, grand fir and Ponderosa pine. The climax vegetation is Douglas fir on north aspects and Ponderosa pine on south aspects with grand fir in the damper areas. The nutrient content of the thinner soils is usually adequate to produce an open stand of Ponderosa pine with an understory of pine grass and elk sedge.

The shrub zones which consist of shallow soils and low rainfall support the bunch grass, bitterbrush type.

d. Soil Pollutants

Sources of soil pollutants are insignificant in the areas.

e. Soil Erosion

Soils in these areas are porous and well drained and present very little opportunity for soil erosion with normal vegetative cover. Soils could present a water erosion problem if the vegetation were removed and water were concentrated by compaction of the soil as in road use. However, erosion can be kept under control by not allowing water to concentrate across ditching, trails and roads, by installing culverts in intermittent streams and by outsloping roads.

f. Geologic Structure

The only mineral deposits known within the area are located in the northern portion and consists of extremely low grade coal seams.

g. Land Use Compatibility

Primary present uses of this land are: 1. Growing timber, 2. Grazing, 3. Wildlife, 4. Recreation, 5. Water.

Past use has caused very little soil erosion. Most of the erosion that has occurred can be traced to using the roads in the fall, as in hunting and not maintaining them to obtain outslope and drainage before they freeze. Most of the commercial users have left the roads in good shape so they could use them again. Timber, grasses, forbes and shrubs tend to revegetate most of the area when given a chance. Programmed activities utilize additional treatments of planting of grasses for erosion control.

Grazing is limited to natural feed areas, meadows and transitory range activities and occurs throughout the area, except for heavy timber stands which limit the forage availability. Recreation use occurs throughout the area and is classed as moderate use during the summer months, primarily with ATV vehicle use, and in the fall, primarily with big game hunting.

Due to the nature of the land, slope, elevation and precipitation, soil and accessibility, the highest and best use of the area is in growing trees and providing for outdoor recreation. The timber lands lend themselves well to a variety of silvicultural treatments ranging from tree-cutting to shelterwood to clearcutting. Most of the timber harvested in the area has been harvested primarily through selective tree cutting. Care must be exercised on some thin soils and south exposures not to overcut as these areas will often come back into brush if cut too heavily.

Generally speaking, most of these timber tracts have adequate moisture and when soil is adequate, will produce a stand of timber of average stocking. Some north aspects can produce overstocking of grand fir. Most of the grazing occurs on the north end utilizing transitory range which is very suitable for grazing.

Introduced grass species are primarily orchard grass, timothy and wheat grasses. Some sheep grazing occurs along the forest boundary in the central portion. Primary wildlife species on the area are Rocky Mountain elk and Mule deer, Blacktail cross, Ruff grouse, Blue grouse, black bear, coyote and bobcat are also found within the area. These species account for most of the hunting pressure. The southern portion of the area provides winter range for deer and elk, while the northern portion is limited to summer range only. The deer and elk tend to migrate tolower elevations on south slopes where browse species are attainable in the winter. The recreation use is primarily limited to roads and trails in the area with the use of ATV vehicles. Snowmobiling has increased dramatically in the last five years and is expected to continue doing so.in the near future, utilizing the road system and open cut-over areas or meadows.

3. Water

a. Hydrologic Cycle

The mean annual precipitation varies from 70" on the western portions to 20" on the eastern portion. Average annual precipitation for the unit is approximately 35". Moisture is the limiting factor in plant growth in the area.Because the ground is porous, there is almost no surface runoff on the vegetated areas. Eighty percent of the precipitation falls as snow between the period of October 1 to April 15. The snow melt usually runs directly into the ground with very little runoff.

b. Sediment Load

Major streams within the area are the South Fork Manastash, the Naches and the Tieton all of which have tributaries which run water year round. Stream channels indicate an occassional flooding usually as a rusult of a rain or Chinook wind on top of a heavy snow covering. Generally rains and snow melt percolate readily into the soil to feed the subterranean water table. There should be no significant increase in amount of contaminants such as dissolve solid chemical, heavy metal, toxic substance, nutrient solid debris and coliform contamination. Changes in acid balance or PH which measures hydrogen ion activity related to acidity and alkalinity of water changes and dissolved oxygen which reveals the concentration of oxygen in the water available to aquatic plants and animals and temperature changes of the water should be minimal. These items in combination with one another will determine what aquatic animal and plant life these small streams will support.

B. Living Components

1. Plants (Aquatic)

The only aquatic plants are those growing in the small streams along their banks, such as watercress, water plantain, water millfoil and bladderworts.

2. Plants(Terrestrial)

Where soil depths and moisture are adequate the areas are well-stocked with all age timber stands in combinations of Douglas-fir, western larch, ponderosa pine, white fir, Englemann spruce, lodgepole pine and western red cedar. General habitat types are as follows:

1. Grass shrub, conisting of bluebunch wheatgrass and bitterbrush.
2. Open ponderosa pine with understory of pinegrass and elk sedge.
3. Douglas-fir, western larch with pachistima understory.
4. True fir overstory with pachistima understory.
5. Lodgepole pine overstory with pinegrass and pachistima.
6. Alpine species with an understory of sagebrush and bluebunch wheatgrass.
7. Dry meadow types consisting of sedges and tufted hairgrass and
8. Wet meadows with sedge and rush.

General brush species found throughout the area are ceanothus, snowberry, oceanspray, serviceberry, chokecherry, thimbleberry, mountain laurel, huckleberry, alder, willow, oregon grape, kinikinik, twinflower dogwood Some hardwood species are cottonwood and alder Some of the more common forbes are lupine, arnica, yarrow, dandelion snowlily, larkspur, balsamroot.

Some of the more common grasses found are pinegrass, cheatgrass, bluebunch wheatgrass, green fescue, sedge, kentucky bluegrass, orchard grass, timothy, intermediate wheatgrass, pubescent wheatgrass and the bromes.

3. Animals (Aquatic)

The few known aquatic animals indigenous to the area are also terrestrial in nature; they are mink, racoon, muskrat and beaver. There are also some rainbow trout and cutthroat trout and eastern brook in local streams and lakes. Good populations of salamanders inhabit the lakes.

4. Animals (Terrestrial)

a. Mammals

Species known or suspected to occur on the areas are listed below.

Mule/black tail deer	Snowshoe hare	Mink
Rocky mountain elk	Cougar	Beaver
Bighorn sheep	Porcupine	Muskrat
Domestic cattle	Striped skunk	Martin
Coyote	Douglas squirrel	Picas
Bobcat	Red tailed chipmunk	Marmots
Long tail weasel	Yellow pine chipmunk	Badger
Short tail weasel	Northern pocket gopher	Fox (cross)
Raccoon	Bushy-tailed wood rat	Columbia Blacktail jackrabbi
Black bear	Field mice	Cottontail rabbit

The areas have several habitat types which help to increase diversity in the mammal population. There are open ponderosa pine-pinegrass types, brush areas, thickets, and Douglas fir-white fir areas. Water can generally be found in the creek bottoms even though it may go underground frequently in local areas.

b. Birds

No inventory of bird life has been made for the areas, however, several species have been observed in the general area. These are listed below. Status and trend are omitted for lack of data. Sightings have been made of bald eagle, goshawk, sharpshinned hawk, coopers robin, varied thrush, mountain bluebird, canada jay, stellars jay, pileated woodpecker, downy woodpecker, hairy woodpecker, american flicker, yellow bellied sapsucker, horned owl, blackbird, black capped chickadee, red breasted nuthatch, brown creeper, pine grossbeak, cedar waxwing, sparrows, mourning dove, finches and juncos. Other birds which have been observed are buzzards, prairie falcon, valley quail, bandtailed pigeon, chukar, Franklin grouse, peregrine falcon and ducks.

c. Amphibians and Reptiles

Amphibians on the areas are limited but should include newt, salamander and frogs. Reptiles include rattlesnake, garter snake, blue racer, bull snake, toads, turtles, tree and ground lizards.

d. Invertebrates

Insects on the area have never been catalogued but more common ones include bees, hornets, flies, wasps, mosquitoes, moths, borers. Forest insects that are common pests in this area include the larch case earer, pine butterfly, Douglas-fir tussock moth, tent caterpillars, flat headed borers, round headed borers, red turpentine beetle, mountain pine beetle, Douglas-fir beetle, western pine beetle, fir engravers, gall aphids and spruce budworm. Spruce budworm outbreaks are reaching epidemic proportions just north of the subject area.

e. Man

Man has in the past influenced several aspects of the area's environment. These include timber harvest, mining claim work, domestic animal grazing, road building, hunting and general recreational activities.

f. Rare and endangered species

The peregrine falcon and bald eagle are endangered species known to use the area.

C. Ecological Interrelationships

1. Succession

The proposed activity will have no impact on the plant succession within the area.

2. Food Relationship

The proposed activity will ave no effect on food relationship within the area.

D. Human Values

1. Landscape Character

The general landscape is mountainous. These rolling to high hills are pleasing to the eye in form, generally timber with second growth trees, mostly coniferous. There are scattered small patches of hardwood in moist areas and along creeks. These hardwoods and the local brush species do lend some color in the fall. The manmade structures are primarily roads with some fencing and an occasional cabin. The highest sensitivity level category is a II and this classification permits an activity which can modify the landscape. The proposed activity would fall well within this management restraint. (Sensitivity level is a measurement of man's sensitivity to the impact of an activity and is on a scale of I to III). Most of the 170,000 people in the Yakima, Kittitas area live in Yakima or Ellensburg which are also the county seats of Yakima and Kittitas counties respecti

Moreover, the distribution of income, wealth and other social economic factors covers a broad range from poverty to affluence.

Terrain and suitability for agriculture and urban uses are major factors in concentration of people. Ninety percent of the people live in the rich agricultural and urbanized valleys. Mountainous terrain and unirrigated dryland areas have few people.

The timber resource from the area provides an important contribution to the economic stability of the area and the forest industry as a whole is rated as third in employment within the two counties. Another social and economic consideration is the big game hunting which occurs in late fall, primarily for the Rocky Mountain elk. General sightseeing and m nor recreational experiences which constitute a lesser social and economic value.

Archaeological values - There is an inventoried archaeological site on the Tieton River just above Windy Point. This is an indian camp site.

Historical values - There is history of a road called the Citizens Road of 1853 in the Bald Mountain area. The exact location has not been found.

Manastash Lake was dammed in the early 1900's for irrigation purposes. This structure has historical value. The Buck Meadows area has remanat coal mines and associated cabins and structures. The above archaeological and historical places will be protected from any activity. This is the end of the environmental report.

Mitigating Measures - Oil and gas lease #OR13584 has serious soil problems in section 8, T 17 N, R 15 E, W.M. See enclosed soil resource inventory map for soil types. Soil types 37, 45, 46, 63 make up the principle soils in section 8. These soils have a high probability of failures in cutbanks and high potential for slumps and slides in road construction.

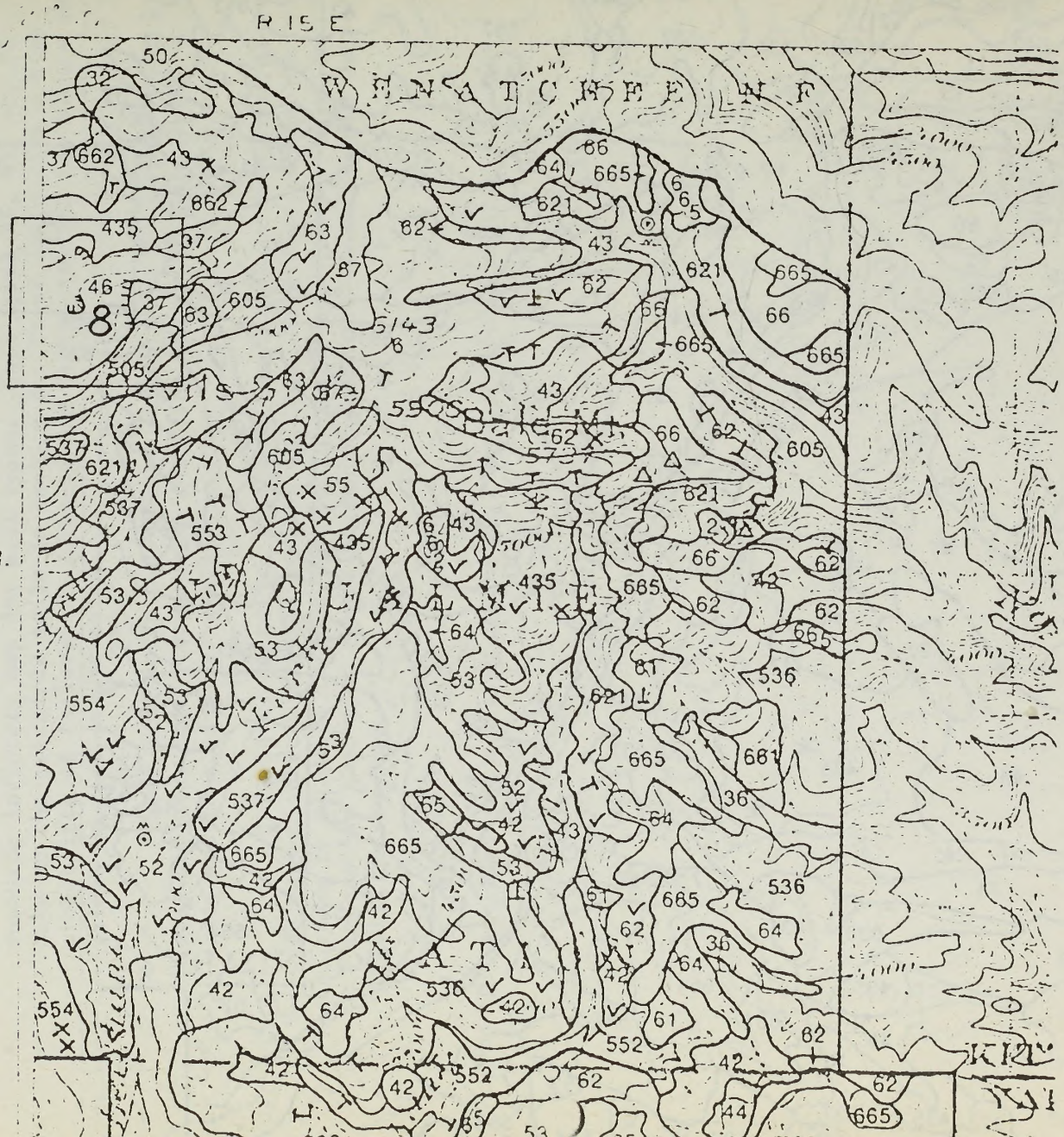
These same soils have a high potential to yield sediment of silt and clay into streams with resulting damage to fish, spawning beds and loss of water quality.

Soil 46 is an active land flow consisting of very deep plastic to very plastic soils and is very unstable. District recommends no roads to be built in this section if it can be avoided. If it becomes imperative that road construction be permitted, extraordinary measures will be required.

End of report.

Attached are 3 copies of the soil maps mentioned above.

Soil Map – U.S.F.S., Dec. 1972


R 15 E
T. 17 N.
WENATCHEE NF
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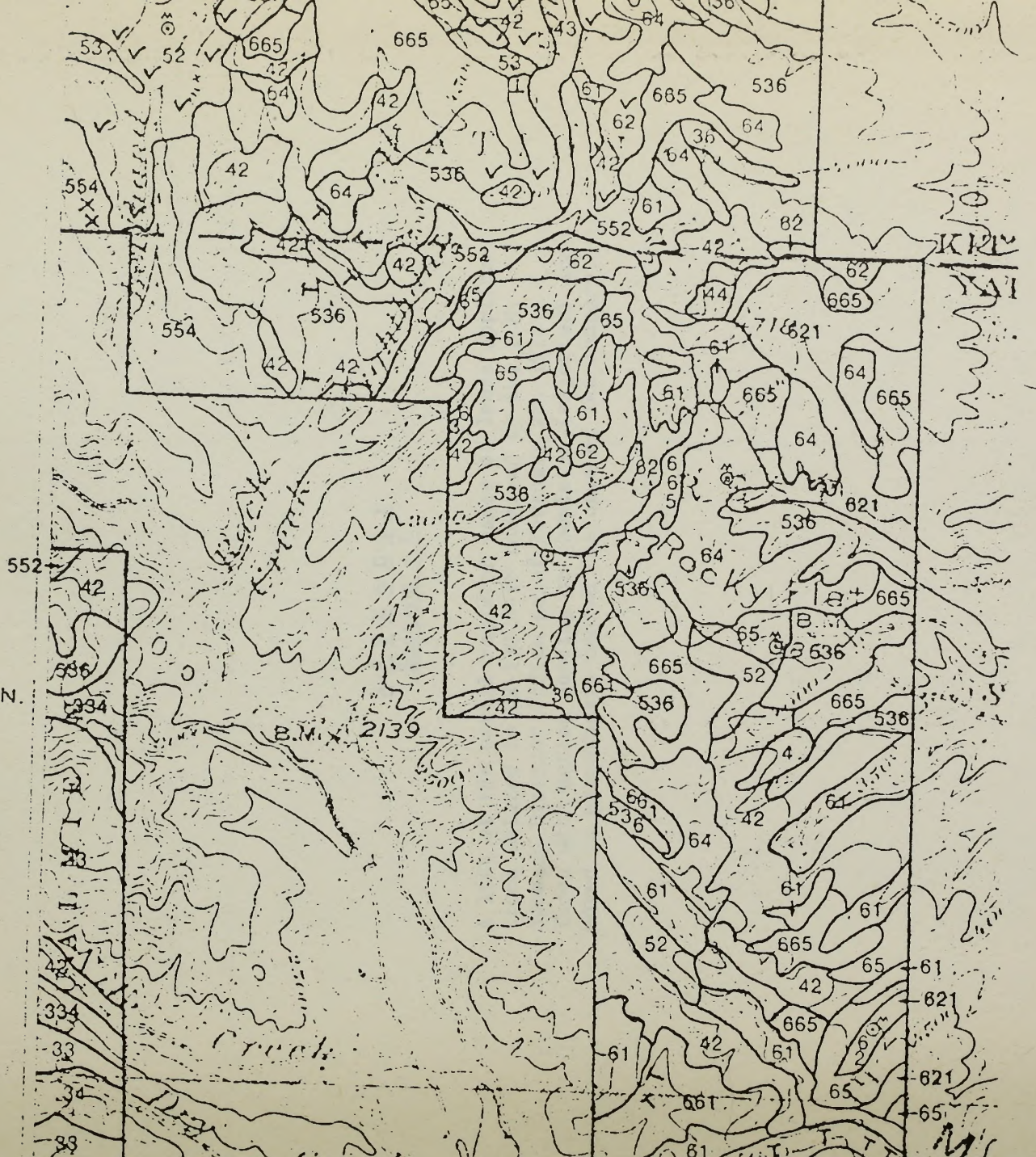
T.16 N.
B.M. x 2139
Rocky
665
536
42
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621
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554
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661
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36

A P P E N D I X
Section - C

A list of the serial register pages of lease applications related to OR-130-6-18 received by the BLM, Spokane District Office as of February 28, 1976. Those with action pending or completed (rejected) are noted in parenthesis behind the name of the company.

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13426 (Wash.)	15	25	12, 18	Shell Oil Company
OR 13427 (Wash.)	15	23	8, 10	Shell Oil Company
OR 13427 (Wash.)	15	25	2, 4	Shell Oil Company
OR 13428 (Wash.)	16	25	32, 34	Shell Oil Company (Rejected)
OR 13429 (Wash.)	15	24	22, 24	Shell Oil Company
OR 13429 (Wash.)	15	24	18, 20	Shell Oil Company
OR 13430 (Wash.)	16	24	32	Shell Oil Company (Withdrawn)
OR 13430 (Wash.)	15	24	12, 14	Shell Oil Company (Withdrawn)
OR 13431 (Wash.)	15	24	10	Shell Oil Company (Rejected)
OR 13431 (Wash.)	15	24	2, 6, 8	Shell Oil Company
OR 13432 (Wash.)	15	20	5, 8, 17,20	Shell Oil Company (Rejected)
OR 13433 (Wash.)	15	16	18	Shell Oil Company
OR 13434 (Wash.)	16	15	14, 24, 26	Shell Oil Company
OR 13434 (Wash.)	15	15	2	Shell Oil Company
OR 13435 (Wash.)	12	21	26, 34	Shell Oil Company
OR 13435 (Wash.)	11	21	2, 10, 12	Shell Oil Company
OR 13436 (Wash.)	12	22	28, 30	Shell Oil Company
OR 13436 (Wash.)	11	22	6, 8, 12	Shell Oil Company
OR 13437 (Wash.)	11	21	4, 6, 8	Shell Oil Company
OR 13438 (Wash.)	15	17	28, 30	Shell Oil Company
OR 13439 (Wash.)	17	21	32	Shell Oil Company
OR 13439 (Wash.)	16	21	4, 18	Shell Oil Company
OR 13440 (Wash.)	12	19	14, 24, 26	Shell Oil Company

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13441 (Wash.)	14	19	11, 12	Shell Oil Company
OR 13441 (Wash.)	14	19	2, 4, 10	Shell Oil Company
OR 13442 (Wash.)	13	24	20, 22	Shell Oil Company (Withdrawal)
OR 13442 (Wash.)	13	23	12	Shell Oil Company (Withdrawal)
OR 13443 (Wash.)	14	15	22, 28, 34	Shell Oil Company
OR 13444 (Wash.)	15	20	32	Shell Oil Company
OR 13444 (Wash.)	14	20	6	Shell Oil Company
OR 13445 (Wash.)	14	15	24, 26	Shell Oil Company
OR 13445 (Wash.)	14	15	12, 14	Shell Oil Company
OR 13446 (Wash.)	12	21	32	Shell Oil Company
OR 13447 (Wash.)	12	23	32, 34	Shell Oil Company
OR 13447 (Wash.)	12	23	26, 28	Shell Oil Company
OR 13448 (Wash.)	16	19	8, 18, 20	Shell Oil Company
OR 13449 (Wash.)	16	20	22, 24	Shell Oil Company
OR 13449 (Wash.)	12	20	12, 20	Shell Oil Company
OR 13450 (Wash.)	16	26	32, 34	Shell Oil Company
OR 13450 (Wash.)	15	26	6, 8, 18	Shell Oil Company
OR 13451 (Wash.)	13	16	30	Shell Oil Company
OR 13452 (Wash.)	13	17	12, 14, 18	Shell Oil Company
OR 13453 (Wash.)	11	23	10, 14	Shell Oil Company
OR 13453 (Wash.)	11	23	4, 6	Shell Oil Company
OR 13454 (Wash.)	15	26	4, 10, 12	Shell Oil Company
OR 13455 (Wash.)			10, 12	Shell Oil Company
OR 13455 (Wash.)	16	15	2, 4	Shell Oil Company

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13456 (Wash.)	15	19	28, 32	Shell Oil Company
OR 13456 (Wash.)	15	19	10, 14	Shell Oil Company
OR 13457 (Wash.)	15	25	13, 14, 15, 19	Shell Oil Company (Withdrawn)
OR 13458 (Wash.)	11	24	4, 6, 8	Shell Oil Company
OR 13459 (Wash.)	15	23	12, 14	Shell Oil Company
OR 13459 (Wash.)	15	23	2, 10	Shell Oil Company (Rejected in part)
OR 13460 (Wash.)	14	19	1, 11, 12	Shell Oil Company
OR 13461 (Wash.)	15	24	19	Shell Oil Company (Withdrawn)
OR 13462 (Wash.)	15	25	20, 21, 24	Shell Oil Company
OR 13463 (Wash.)	16	15	15, 23	Shell Oil Company
OR 13463 (Wash.)	16	15	11, 13	Shell Oil Company
OR 13464 (Wash.)	15	15	2	Shell Oil Company
OR 13464 (Wash.)	16	15	25, 26	Shell Oil Company
OR 13464 (Wash.)	16	16	5	Shell Oil Company
OR 13465 (Wash.)	16	20	29, 32	Shell Oil Company
OR 13466 (Wash.)	15	26	23, 24	Shell Oil Company
OR 13466 (Wash.)	15	26	13, 14	Shell Oil Company
OR 13467 (Wash.)	16	15	5, 9	Shell Oil Company
OR 13467 (Wash.)	16	15	1, 3	Shell Oil Company
OR 13468 (Wash.)	15	26	21, 22	Shell Oil Company
OR 13468 (Wash.)	15	26	15, 20	Shell Oil Company
OR 13469 (Wash.)	14	20	5, 7, 8	Shell Oil Company
OR 13470 (Wash.)	15	20	29, 30, 32	Shell Oil Company
OR 13471 (Wash.)	13	24	16, 22	Shell Oil Company (Rejected in part)

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13471 (Wash.)	13	23	10	Shell Oil Company
OR 13495 (Wash.)	12	24	34	Shell Oil Company
OR 13495 (Wash.)	11	24	8, 10	Shell Oil Company
OR 13496 (Wash.)	13	20	8	Shell Oil Company
OR 13496 (Wash.)	13	19	4, 10	Shell Oil Company
OR 13497 (Wash.)	12	23	22	Shell Oil Company
OR 13497 (Wash.)	11	23	2	Shell Oil Company
OR 13504 (Wash.)	15	19	22, 24, 26	Shell Oil Company
OR 13505 (Wash.)	13	24	20, 22	Shell Oil Company (Rejected in part)
OR 13505 (Wash.)	13	23	12	Shell Oil Company (Rejected)
OR 13506 (Wash.)	16	24	32	Shell Oil Company (Rejected)
OR 13506 (Wash.)	15	24	12, 14	Shell Oil Company
OR 13507 (Wash.)	15	24	19	Shell Oil Company (Rejection Pending)
OR 13508 (Wash.)	15	25	15, 19	Shell Oil Company
OR 13508 (Wash.)	15	25	13, 14	Shell Oil Company
OR 13517 (Wash.)	15	17	14, 20	Shell Oil Company
OR 13538 (Wash.)	13	17	8	Shell Oil Company
OR 13538 (Wash.)	13	16	10, 14	Shell Oil Company
OR 13539 (Wash.)	14	16	30	Shell Oil Company
OR 13539 (Wash.)	13	16	2, 4	D. H. Yates
OR 13562 (Wash.)	14	16	32, 34	D. H. Yates
OR 13562 (Wash.)	14	16	18, 26, 28	D. H. Yates
OR 13563 (Wash.)	15	19	20, 30	D. H. Yates
OR 13563 (Wash.)	15	19	6, 8	D. H. Yates

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13564 (Wash.)	16	19	22, 32, 34	D. H. Yates
OR 13564 (Wash.)	15	20	6	D. H. Yates
OR 13564 (Wash.)	15	19	2, 4, 12	D. H. Yates
OR 13571 (Wash.)	16	15	36	D. H. Yates
OR 13572 (Wash.)	13	16	12	D. H. Yates
OR 13584 (Wash.)	17	15	6, 8	Texaco Inc.
OR 13584 (Wash.)	17	15	2, 4	Texaco Inc.
OR 13585 (Wash.)	17	15	22, 24	Texaco Inc.
OR 13585 (Wash.)	17	15	14, 16	Texaco Inc.
OR 13586 (Wash.)	18	15	34, 36	Texaco Inc.
OR 13586 (Wash.)	17	15	10, 12	Texaco Inc.
OR 13587 (Wash.)	18	15	30, 32	Texaco Inc.
OR 13587 (Wash.)	18	15	26, 28	Texaco Inc.
OR 13588 (Wash.)	18	15	22, 24	Texaco Inc.
OR 13588 (Wash.)	18	15	14, 20	Texaco Inc.
OR 13589 (Wash.)	18	15	5, 19	Texaco Inc.
OR 13589 (Wash.)	18	15	2, 4	Texaco Inc.
OR 13590 (Wash.)	18	15	12, 13	Texaco Inc.
OR 13590 (Wash.)	18	15	1, 10	Texaco Inc.
OR 13591 (Wash.)	18	15	17, 18	Texaco Inc.
OR 13591 (Wash.)	18	15	8, 16	Texaco Inc.
OR 13592 (Wash.)	18	14	24, 25, 26	Texaco Inc.
OR 13593 (Wash.)	16	15	36	Texaco Inc.
OR 13603 (Wash.)	16	16	34	Shell Oil Co.

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13631 (Wash.)	16	16	21, 22	Shell Oil Company
OR 13631 (Wash.)	13	24	18, 20	Shell Oil Company (Rejection Pending)
OR 13632 (Wash.)	13	24	16, 17	Shell Oil Company
OR 13632 (Wash.)	13	24	7, 9, 10	Shell Oil Company
OR 13633 (Wash.)	15	23	22, 24	Shell Oil Company
OR 13634 (Wash.)	13	24	8, 10	Shell Oil Company
OR 13634 (Wash.)	13	24	3, 4	Shell Oil Company (Rejection Pending)
OR 13635 (Wash.)	13	23	14, 24	Shell Oil Company
OR 13636 (Wash.)	13	24	18, 19	Shell Oil Company
OR 13636 (Wash.)	13	24	8, 15	Shell Oil Company
OR 13637 (Wash.)	16	21	4, 18	Shell Oil Company
OR 13638 (Wash.)	15	26	2, 10	Shell Oil Company
OR 13639 (Wash.)	16	20	18, 20	Shell Oil Company
OR 13639 (Wash.)	16	19	4	Shell Oil Company
OR 13640 (Wash.)	16	19	6, 8	Shell Oil Company
OR 13641 (Wash.)	16	18	30, 32	Shell Oil Company
OR 13641 (Wash.)	15	17	4	Shell Oil Company
OR 13642 (Wash.)	16	18	14	E. H. Holcomb
OR 13667 (Wash.)	16	17	26, 28	D. H. Yates
OR 13667 (Wash.)	16	17	22, 24	D. H. Yates
OR 13668 (Wash.)	16	18	26	D. H. Yates
OR 13669 (Wash.)	15	17	24, 26	D. H. Yates
OR 13669 (Wash.)	15	17	2, 6, 12	R. E. Puckett
OR 13671 (Wash.)	11	22	20, 22	R. E. Puckett

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13671 (Wash.)	11	22	14, 18	R. E. Puckett
OR 13672 (Wash.)	11	23	18, 26, 34	R. E. Puckett
OR 13673 (Wash.)	12	24	4, 6, 22	R. E. Puckett
OR 13673 (Wash.)	12	23	2, 12, 14	R. E. Puckett
OR 13674 (Wash.)	12	20	30	R. E. Puckett
OR 13674 (Wash.)	11	20	2	R. E. Puckett
OR 13675 (Wash.)	11	21	14, 24	R. E. Puckett
OR 13679 (Wash.)	17	15	32	R. E. Puckett
OR 13679 (Wash.)	17	15	18, 20, 30	R. E. Puckett
OR 13680 (Wash.)	17	15	34, 36	R. E. Puckett
OR 13680 (Wash.)	17	15	26, 28	R. E. Puckett
OR 13683 (Wash.)	15	25	30	R. E. Puckett
OR 13683 (Wash.)	15	24	28	R. E. Puckett
OR 13684 (Wash.)	15	26	8	R. E. Puckett
OR 13781 (Wash.)	17	26	34	Shell Oil Company
OR 13781 (Wash.)	17	26	26, 29, 30	Shell Oil Company
OR 13781 (Wash.)	17	26	21, 22, 24	Shell Oil Company
OR 13781 (Wash.)	17	26	17, 18, 19	Shell Oil Company
OR 13782 (Wash.)	17	27	29, 30	Shell Oil Company
OR 13782 (Wash.)	17	27	17, 18, 19	Shell Oil Company
OR 13783 (Wash.)	17	25	14, 22, 24	Shell Oil Company
OR 13783 (Wash.)	17	25	10, 11, 12	Shell Oil Company
OR 13784 (Wash.)	17	27	27, 34	Shell Oil Company
OR 13784 (Wash.)	17	27	23, 25, 26	Shell Oil Company

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13784 (Wash.)	17	27	20, 21, 22	Shell Oil Company
OR 13785 (Wash.)	17	25	19, 20	Shell Oil Company
OR 13785 (Wash.)	17	24	4, 22	Shell Oil Company
OR 13786 (Wash.)	17	23	6, 8	Shell Oil Company
OR 13786 (Wash.)	18	23	32, 34, 36	Shell Oil Company
OR 13787 (Wash.)	17	22	4, 8, 10	Shell Oil Company
OR 13788 (Wash.)	17	22	2, 12	Shell Oil Company
OR 13789 (Wash.)	18	22	32, 34	Shell Oil Company
OR 13789 (Wash.)	17	22	6	Shell Oil Company
OR 13796 (Wash.)	17	23	4	Shell Oil Company
OR 13797 (Wash.)	12	15	12	Shell Oil Company
OR 13798 (Wash.)	17	24	22	Shell Oil Company
OR 13799 (Wash.)	11	24	28	Shell Oil Company
OR 13800 (Wash.)	16	16	2	Shell O l Company
OR 13801 (Wash.)	16	17	12	Shell Oil Company
OR 13826 (Wash.)	16	21	8	D. H. Yates
OR 13826 (Wash.)	16	20	12	D. H. Yates
OR 13854 (Wash.)	13	16	8	Shell Oil Company
OR 13855 (Wash.)	13	18	18	Shell Oil Company
OR 13855 (Wash.)	13	17	10	Shell Oil Company
OR 13856 (Wash.)	16	19	6	Shell Oil Company
OR 13883 (Wash.)	11	23	24, 34	D. H. Yates
OR 13883 (Wash.)	11	23	8, 12	D. H. Yates
OR 13884 (Wash.)	11	24	18, 32, 34	D. H Yates

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 13885 (Wash.)	13	16	34	D. H. Yates
OR 13886 (Wash.)	16	21	30	D. H. Yates
OR 13886 (Wash.)	16	20	28, 34	D. H. Yates
OR 14777 (Wash.)	18	20	22	Shell Oil Company
OR 14777 (Wash.)	18	20	16, 20	Shell Oil Company
OR 14778 (Wash.)	18	20	26, 34, 26	Shell Oil Company
OR 14779 (Wash.)	18	21	36	Shell Oil Company
OR 14779 (Wash.)	17	21	4	Shell Oil Company
OR 13957 (Wash.)	13	23	26, 28	D. H. Yates
OR 13957 (Wash.)	13	23	20, 22	D. H. Yates
OR 13958 (Wash.)	13	20	6	D. H. Yates
OR 15105 (Wash.)	13	24	16	Shell Oil Company
OR 15105 (Wash.)	13	23	10	Shell Oil Company
OR 15131 (Wash.)	15	26	14	Shell Oil Company
OR 15190 (Wash.)	15	20	30	Shell Oil Company
OR 15191 (Wash.)	15	20	5, 6, 17, 20	Shell Oil Company
OR 15432 (Wash.)	17	21	6	D. H. Yates
OR 15433 (Wash.)	15	19	4	D. H. Yates
OR 15433 (Wash.)	16	19	28	D. H. Yates
OR 15434 (Wash.)	13	17	4, 10, 24	D. H. Yates
OR 15434 (Wash.)	13	18	18	D. H. Yates
OR 15435 (Wash.)	16	16	2, 5	D. H. Yates
OR 15436 (Wash.)	15	15	2	D. H. Yates
OR 15436 (Wash.)	16	15	9	D. H. Yates

Serial Number	Township N.	Range E.	Sections or Portions of Sections	Company making request
OR 15440 (Wash.)	15	20	8	D. H. Yates
OR 15441 (Wash.)	13	24	18, 20, 22	Shell Oil Company
OR 15441 (Wash.)	13	23	12	Shell Oil Company
OR 15442 (Wash.)	14	19	2, 4, 10, 12	Shell Oil Company
OR 15443 (Wash.)	14	19	11, 12	Shell Oil Company
OR 15444 (Wash.)	15	20	8	Shell Oil Company

A P P E N D I X
Section - D

EXAMPLES OF SITE-SPECIFIC OIL AND GAS LEASE STIPULATIONS

EXAMPLES OF SITE-SPECIFIC OIL AND GAS LEASE STIPULATIONS

1. All of the land in this lease is included in (recreation or special area, etc.). Therefore, no occupancy or disturbance of the surface of the land described in this lease is authorized. The lessee, however, may exploit the oil and gas resources in this lease by directional drilling from sites outside this lease. If a proposed drilling site lies on land administered by the Bureau of Land Management, a permit for use of the site must be obtained from the BLM District Manager before drilling or other development begins.

2. No access or work trail or road, earth cut or fill, structure or other improvement, other than an active drilling rig, will be permitted if it can be viewed from the (road, lake, river, etc.).

3. No occupancy or other activity on the surface of (legal subdivision) is allowed under this lease.

4. No occupancy or other surface disturbance will be allowed within _____ feet of the _____ (Road, Trail, River, Creek, Canal, etc.). This distance may be reduced when specifically approved in writing by the District Engineer, Geological Survey, with the concurrence of the District Manager, Bureau of Land Management.

5. No drilling or storage facilities will be allowed within _____ feet of (live water, the reservoir, etc.) located in (legal subdivision). This distance may be reduced when specifically approved in writing by the District Engineer, Geological Survey, with the concurrence of the District Manager, Bureau of Land Management.

6. No occupancy or other surface disturbance will be allowed on slopes in excess of _____ percent, without written permission from the District Engineer, Geological Survey, with the concurrence of the District Manager, Bureau of Land Management.

7. In order to (minimize watershed damage, protect important seasonal wildlife habitat, etc.) exploration, drilling, and other development activity will be allowed only during the period from _____ to _____. This limitation does not apply to maintenance and operation of producing wells. Exceptions to this limitation in any year may be specifically authorized in writing by the District Engineer, Geological Survey, with the concurrence of the District Manager, Bureau of Land Management.

8. In order to minimize watershed damage, during muddy and/or wet periods the District Manager, Bureau of Land Management, through

the District Engineer, Geological Survey, may prohibit exploration, drilling or other development. This limitation does not apply to maintenance and operation of producing wells.

9. The _____ (Trail/Road) will not be used as an access road for activities on this lease.

10. To maintain esthetic values, all semi-permanent and permanent facilities will be painted or camouflaged to blend with the natural surroundings. The paint selection or method of camouflage will be subject to approval by the District Engineer, Geological Survey, with the concurrence of the District Manager, Bureau of Land Management.

11. Antiquities and Objects of Historic Value Stipulation

The following special stipulation should be attached to the Oil & Gas lease form (Form 3120-3).

> Prior to any operations under this lease, the Lessee will engage a qualified archeologist, acceptable to the Authorized Officer, to make an archeological survey of the land to be disturbed or occupied. A certified statement, signed by the qualified archeologist, setting out the steps taken in the survey and the findings thereof as to the existence of antiquities or other objects of historic or scientific interest, shall be submitted to the Authorized Officer. If the statement indicates the existence of such objects which might be disturbed by operations under this lease, the Lessee shall take such steps as may be required by the Authorized Officer, including archeological salvage. The responsibility for the cost of the certificate, survey, and salvage will be borne by the Lessee, and such salvaged property shall remain the property of the Lessor or the surface owner.
>
> The Lessee shall immediately bring to the attention of the Authorized Officer any antiquities or other objects of historic or scientific interest, including but not limited to historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this lease, and shall leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the Authorized Officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 U.S.C. 431-433).

12. Sage Grouse Stipulation

The following described lands have been identified as critical habitat for the mating, nesting and brood rearing of sage grouse. Therefore, prior to entry onto the lands, the operator will discuss the proposed activities jointly with the Area Oil and Gas Supervisor and the District Manager who may require additional measures for the protection of the sage grouse. Such measures may include:

1. No surface occupancy on the actual strutting grounds.

2. Restriction of activity during the months of April through July in brood rearing areas.

A P P E N D I X
Section - E

EXAMPLES OF BLM LEASE FORMS
AND STIPULATIONS

Form 3109–3
(June 1971)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SAMPLE

STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF AGRICULTURE*

The lands embraced in this lease or permit being under the jurisdiction of the Secretary of Agriculture, the lessee or permittee hereby agrees:

(1) To conduct all operations authorized by this lease or permit with due regard for good land management, not to cut or destroy timber without first obtaining permission from the authorized representative of the Secretary of Agriculture, and to pay for all such timber cut or destroyed at the rates prescribed by such representative; to avoid unnecessary damage to improvements, timber, crops, or other cover; unless otherwise authorized by the Secretary of Agriculture, not to drill any well, carry on operations, make excavations, construct tunnels, drill, or otherwise disturb the surface of the lands within 200 feet of any building standing on the lands and whenever required, in writing, by the authorized representative of the Secretary of Agriculture to fence or fill all sump holes, ditches, and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the lands to their former condition, including the removal of structures as and if required, and when required by such representative to bury all pipelines below plow depth.

(2) To do all in his power to prevent and suppress forest, brush, or grass fires on the lands and in their vicinity, and to require his employees, contractors, subcontractors, and employees of contractors or subcontractors to do likewise. Unless prevented by circumstances over which he has no control, the lessee or permittee shall place his employees, contractors, subcontractors, and employees of contractors and subcontractors employed on the lands at the disposal of any authorized officer of the Department of Agriculture for the purpose of fighting forest, brush, or grass fires on or originating on the lands or on adjacent areas or caused by the negligence of the lessee or permittee or his employees, contractors, subcontractors and employees of contractors and subcontractors, with the understanding that payment for such services shall be made at rates to be determined by the authorized representative of the Secretary of Agriculture, which rates shall not be less than the current rates of pay prevailing in the vicinity for services of a similar character: *Provided*, that if the lessee or permittee, his employees, contractors, subcontractors, or employees of contractors or subcontractors, caused or could have prevented the origin or spread of said fire or fires, no payment shall be made for services so rendered.

During periods of serious fire danger to forest, brush, or grass, as may be specified by the authorized representative of the Secretary of Agriculture, the lessee or permittee shall prohibit smoking and the building of camp and lunch fires by his employees, contractors, subcontractors, and employees of contractors or subcontractors within the area involved except at established camps, and shall enforce this prohibition by all means within his power: *Provided*, that the authorized representative of the Secretary of Agriculture may designate safe places where, after all inflammable material has been cleared away, campfires may be built for the purpose of heating lunches and where, at the option of the lessee or permittee, smoking may be permitted.

The lessee or permittee shall not burn rubbish, trash, or other inflammable materials *except* with the consent of the authorized representative of the Secretary of Agriculture and shall not use explosives in such a manner as to scatter inflammable materials on the surface of the lands during the forest, brush, or grass fire season, *except* as authorized to do so or on areas approved by such representative.

The lessee or permittee shall build or construct such fire lines or do such clearing on the lands as the authorized representative of the Secretary of Agriculture decides is essential for forest, brush, and grass fire prevention which is or may be necessitated by the

* This form of stipulation may be used in connection with leases and permits issued under the Acts of February 25, 1920, as amended (30 U.S.C. 181 *et seq.*); August 7, 1947 (30 U.S.C. 351 *et seq.*); February 7, 1927, as amended (30 U.S.C. 281 *et seq.*); April 17, 1926, as amended (30 U.S.C. 271 *et seq.*); June 28, 1944 (58 Stat. 483–485); September 1, 1949 (30 U.S.C. 192c); June 30, 1950 (16 U.S.C. 508b); or under the authority of any of the Acts cited in Section 402 of the President's Reorganization Plan No. 3 of 1946 (5 U.S.C. 133y–16, Note).

exercise of the privileges authorized by this lease or permit, and shall maintain such fire tools at his headquarters or at the appropriate location on the lands as a[illegible]eemed necessary by such representative.

(3) In the location, design, construction, and maintenance of all authorized works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures or clearance, the lessee or permittee shall do all things reasonably necessary to prevent or reduce to the fullest extent scarring and erosion of the lands, pollution of the water resources and any damage to the watershed. Where construction, operation, or maintenance of any of the facilities on or connected with this lease or permit causes damage to the watershed or pollution of the water resources, the lessee or permittee agrees to repair such damage and to take such corrective measures to prevent further pollution or damage to the watershed as are deemed necessary by the authorized representative of the Secretary of Agriculture.

(4) If in the opinion of the authorized representative of the Secretary of Agriculture, the lands are valuable for watershed protection, the lessee or permittee shall provide for control of surface runoff and return the affected area to as productive condition as practicable.

([illegible])o pay the lessor or permitter or his tenant or the surface owner or his tenant, as the case may be, for any and all damage to or destruction of property caused by the lessee's or permittee's operations hereunder; to save and hold the lessor or permitter or the surface owner or their tenants harmless from all damage or claims for damage to persons or property resulting from the lessee's or permittee's operations under this lease or permit.

(6) To recognize existing uses and commitments, in the form of Department of Agriculture grazing, timber cutting, and special use permits, water developments, ditch, road, trail, pipeline, telephone line, and fence rights-of-way and other similar improvements, and to conduct his operations so as to interfere as little as possible with the rights and privileges granted by these permits or with other existing uses.

(7) To install and maintain cattle guards to prevent the passage of livestock in any openings made in fences by the lessee or permittee or his contractors to provide access to the lands covered by this lease or permit for automotive and other equipment.

(8) If lessee or permittee shall construct any camp on the lands, such camp shall be located at a place approved by the authorized representative of the Secretary of Agriculture, and such representative shall have authority to require that such camp be kept in a neat and sanitary condition.

(9) To comply with all federally-approved rules and regulations of the Secretary of Health, Education, and Welfare governing the emission of pollutants into the air from activities which are embraced in this lease or permit.

(10) To comply with all the rules and regulations of the Secretary of Agriculture governing the national forests or other lands under his jurisdiction which are embraced in this lease or permit.

(11) Unless otherwise authorized, prior to the beginning of operations to appoint and maintain at all times during the term of this lease or permit a local agent upon whom may be served written orders or notices respecting matters contained in this stipulation, and to inform the authorized representative of the Secretary of Agriculture, in writing, of the name and address of such agent. If a substitute agent is appointed, the lessee or permittee shall immediately so inform the said representative.

(12) To address all matters relating to this stipulation to

at

who is the authorized representative of the Secretary of Agriculture, or to such other representative as may from time to time, be designated, provided that such designation shall be in writing and be delivered to the lessee or permittee or his agent.

(Signature of Lessee)

SAMPLE

☆U.S. Government Printing Office: 1971-780-512/81 Region 8

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SURFACE DISTURBANCE STIPULATIONS

Area Oil and Gas Supervisor or
District Engineer *(Address, include zip code)*

SAMPLE

Management Agency *(name)*	Address *(include zip code)*

1. Notwithstanding any provision of this lease to the contrary, any drilling, construction, or other operation on the leased lands that will disturb the surface thereof or otherwise affect the environment, hereinafter called "surface disturbing operation," conducted by lessee shall be subject, as set forth in this stipulation, to prior approval of such operation by the Area Oil and Gas Supervisor in consultation with appropriate surface management agency and to such reasonable conditions, not inconsistent with the purposes for which this lease is issued, as the Supervisor may require to protect the surface of the leased lands and the environment.

2. Prior to entry upon the land or the disturbance of the surface thereof for drilling or other purposes, lessee shall submit for approval two (2) copies of a map and explanation of the nature of the anticipated activity and surface disturbance to the District Engineer or Area Oil and Gas Supervisor, as appropriate, and will also furnish the appropriate surface management agency named above, with a copy of such map and explanation.

An environmental analysis will be made by the Geological Survey in consultation with the appropriate surface management agency for the purpose of assuring proper protection of the surface, the natural resources, the environment, existing improvements, and for assuring timely reclamation of disturbed lands.

3. Upon completion of said environmental analysis, the District Engineer or Area Oil and Gas Supervisor, as appropriate, shall notify lessee of the conditions, if any, to which the proposed surface disturbing operations will be subject.

Said conditions may relate to any of the following:

(a) Location of drilling or other exploratory or developmental operations or the manner in which they are to be conducted;

(b) Types of vehicles that may be used and areas in which they may be used; and

(c) Manner or location in which improvements such as roads, buildings, pipelines, or other improvements are to be constructed.

SAMPLE

Form 3109–5 (August 1973)

GPO 849-258

SAMPLE

Form 3109–2
(December 1970)
(formerly 3103–3)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Serial Number

Name of Project
SAMPLE

STIPULATION FOR LANDS UNDER JURISDICTION OF DEPARTMENT OF THE ARMY, CORPS OF ENGINEERS

The lands embraced in this lease issued under the Mineral Leasing Act of February 25, 1920 (41 Stat. 437; 30 U.S.C. 181 *et seq.*), as amended, or the Mineral Leasing Act for Acquired Lands of August 7, 1947 (61 Stat. 913; 30 U.S.C. 351 *et seq.*) being under the jurisdiction of the Department of the Army, Corps of Engineers, the lessee hereby agrees:

(1) That *all* rights under this lease are subordinate to the rights of the United States to flood and submerge the lands, permanently or intermittently, in connection with the operation and maintenance of the above-named project.

(2) That the United States shall *not* be responsible for damages to property or injuries to persons which may arise from or be incident to the use and occupation of the said premises, or for damages to the property of the lessee, or for injuries to the person of the lessee (an individual), or for damages to the property or injuries to the person of the lessee's officers, agents, servants, or employees, or others who may be on said premises at their invitation or the invitation of any one of them arising from or incident to the flooding of the said premises by the Government or flooding from any other cause, or arising from or incident to any other governmental activities; and the lessee shall hold the United States harmless from any and all such claims.

(3) That the work performed by the lessee on the lands shall be under the general supervision of the District Engineer, Corps of Engineers, in direct charge of the project, and subject to such conditions and regulations as may be prescribed by him, and the plans and location for all structures, appurtenances thereto, and work on said lands shall be submitted to the said District Engineer for approval, in advance, of commencement of any work on said lands. The District Engineer shall have the right to enter on the premises, at any time, to inspect both the installation and operational activities of the lessee.

(4) That no structure or appurtenance thereto shall be of a material or construction determined to create floatable debris.

(5) That the construction and operation of said structures and appurtenances thereto shall be of such a nature as not to cause pollution of the soils and the waters of the project.

(6) That the United States reserves the right to use the land jointly with the lessee in connection with the construction, operation, and maintenance of the Government project and to place improvements thereon or to remove materials therefrom, including sand and gravel and other construction material, as may be necessary in connection with such work, and the lessee shall not interfere, in any manner, with such work or do any act which may increase the cost of performing such work. If the cost of the work performed by the Government at and in connection with the project, including work performed on lands outside the property included in the lease, is made more expensive by reason of improvements constructed on the leased property by the lessee, the lessee shall pay to the United States money in an amount, as estimated by the Chief of Engineers, sufficient to compensate for the additional expense involved.

SAMPLE

(Signature of Lessee)

GPO 832-493

Form 3040–4
(September 1970)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SAMPLE

MINERAL LEASING ACTS

SURFACE MANAGEMENT REQUIREMENTS FOR EXPLORATION, MINING, AND RECLAMATION

Stipulations may be selected from the following list for inclusion in permits or leases. Care must be exercised to assure that any stipulation used apply specifically to the need for such stipulation. Other stipulations may be drafted as needed to meet specific problems.

1. Activities employing wheeled or tracked vehicles shall be conducted in accordance with industry practices and in such a manner as to minimize surface damage.

2. Trail widths shall be kept to the minimum necessary and may not exceed feet. Surface may be cleared of timber, stumps, and snags. Care must be taken to avoid scarring or removal of ground vegetative cover.

3. Drainage systems shall not be blocked. No cuts or fills shall be made near or in streams which will result in siltation or accumulation of debris. All damage to streams must be repaired to the satisfaction of the authorized officer.

All operations must be conducted so as not to change the character or cause pollution of streams, lakes, ponds, waterholes, seeps, and marshes or cause damage to fish and wildlife resources.

5. Surface damage which causes soil movement and/or water pollution must be corrected to the satisfaction of the authorized officer.

6. Vegetation must not be disturbed within 300 feet of any waters designated in a (prospecting permit) (lease) (contract) *except* at authorized stream crossings.

7. No explosives may be used without prior written consent of the authorized officer.

8. Trails and campsites must be kept clean. All garbage and foreign debris must be eliminated by removal or burial. Burning is permissible only by prior written consent of the authorized officer.

9. Existing roads and trails shall be used whenever possible.

10. All survey monuments, witness corners, reference monuments, and bearing trees must be protected against destruction, obliteration, or damage. Any damaged or obliterated markers must be reestablished in accordance accepted survey practices at expense of (permittee) (contractor) (lessee).

11. The operator shall make every effort to prevent, control, or suppress any fire in the operating area. Reports of uncontrolled fires must be immediately sent to the authorized officer or his representatives.

12. Fill all holes, pits, and excavations to the extent agreed in the approved mining plan and grade to the natural contour.

13. When surface operations are conducted, overburden or other waste shall be returned to the excavation, as set forth in the mining plan and except in instances when the district manager or state director determines that it would be desirable to use an excavation for the permanent impoundment of water or for other beneficial uses.

14. Disposal sites shall be selected and prepared so as to avoid downward percolation of pollutants into aquifers.

15. Disposal systems for solid and liquid wastes shall be designed and constructed so as to avoid landslides, control wind and water erosion, and establish conditions conducive to vegetative growth in the disposal area.

16. Casual accumulations of water on waste piles shall be avoided, and, where necessary, surface waters shall be directed around the piles.

17. Final grading of backfilled and other unconsolidated materials shall be so performed as to present a surface susceptible to vegetation or desired land form.

18. Excavations used for the permanent impoundment of water shall be graded to establish safe access to water for persons, livestock, and wildlife.

19. No solid rock face or bench face shall exceed feet in height. Appropriate access suitable for persons, lifestock, and wildlife shall be provided for every feet of continuous rock or bench face.

20. Except for solid rock faces, bench faces, and excavations used for impoundment of water, those surface areas of the leased premises disturbed by operations conducted by the lessee shall be revegetated when their use is no longer required by the operator. *(Species, methods, and season of seeding or planting, etc. should be specified. These requirements should be practical and generally should not require vegetative rehabilitation beyond level of production.)*

21. Backfilling, final grading, and vegetation shall be completed within two (2) years after the completion or termination of the particular operation involved unless the district manager extends the time.

SAMPLE

Drill holes shall be permanently sealed or filled as directed by the district manager upon completion of operations.

23. Surface buildings, supporting facilities, and other structures which are not required for particular operations shall be removed and the area graded and revegetated.

24. All operations shall be conducted with a view to avoidance of range and forest fires and spontaneous combustion. Open burning of carbonaceous materials shall be in accordance with suitable practices for fire prevention and control.

25. The lease or contract premises shall be appropriately posted and fenced or otherwise protected to minimize injury to persons, livestock, and wildlife.

26. All access, haul, and other support roads and trails shall be constructed and maintained in such a manner as to control and minimize channeling and other erosion. Roads and trails shall be constructed only at locations approved by the authorized officer.

27. All roads constructed in the operation shall be closed by barricades or protected from erosion by placing of water control bars as required by the district manager.

28. All existing improvements including, but not limited to, fences, gates, cattle guards, roads, trails, culverts, pipelines, bridges, public land survey monuments, and water development and control structures shall be maintained in serviceable condition. Damaged or destroyed improvements shall be replaced, restored, or appropriately compensated for.

29. When agreed by lessee and lessor, the lease site shall be available for other public uses including, but not limited to, livestock, grazing, hunting, fishing, camping, hiking, and picnicking.

30. Topsoil shall be removed and stockpiled prior to removal of overburden. Stockpiles shall be located so as not to be covered by spoil materials and to facilitate their use in final backfilling and grading.

GPO 830-737

SAMPLE

Form 3040-1
(November 1970)
(Formerly 3107-1)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

NOTICE OF INTENT TO CONDUCT OIL AND GAS EXPLORATION OPERATIONS

Name	Address *(include zip code)*

hereby files this "Notice of Intent to Conduct Oil and Gas Exploration Operations" across and upon *(give description of lands by township(s) and range)*

SAMPLE

The type of operation to be pursued is ☐ magnetometer ☐ seismograph ☐ other *(specify)*

Approximate date of commencement of operations . Upon completion of work, the Bureau of Land Management District Manager shall be furnished a "Notice of Completion of Oil and Gas Exploration Operations."

The undersigned agrees that oil and gas exploration operations will be conducted pursuant to the following terms and conditions:

1. Exploration operations shall be conducted in compliance with all Federal, State and County laws, ordinances or regulations which are applicable to the area of operations including, but not limited to, those pertaining to fire, sanitation, conservation, water pollution, fish and game. All operations hereunder shall be conducted in a prudent manner.
2. Due care will be exercised in protecting lands in this notice. All necessary precautions shall be taken to avoid any damage other than normal wear and tear, to gates, bridges, roads, culverts, cattle guards, fences, dams, dykes, vegetative cover and improvements, and stock watering and other facilities.
3. Appropriate procedures shall be taken to protect any shafts, pits or tunnels, and shot holes shall be capped when not in use to protect the lives, safety, or property of other persons or of wildlife and livestock.
4. All vehicles shall be operated at a reasonable rate of speed, and due care must be taken to safeguard all livestock and wildlife in the vicinity of his operations. Bulldozers shall not be used without advance notification to the District Manager. Existing roads and trails shall be used wherever possible; if new roads and trails are made, care should be taken to follow natural contours of the lands where feasible and restoration and/or reseeding, as requested by District Manager shall be made.
5. Upon expiration, revocation or abandonment of operations conducted pursuant to this "Notice," all equipment shall be removed from the land and the land shall be restored as nearly as practicable to its original condition by such measures as the District Manager may specify. All geophysical holes must be safely plugged. Upon leaving the land, the District Manager shall be informed.
6. Upon request, the location and depth of water sands encountered shall be disclosed to the District Manager.
7. The party conducting such operations shall contact the District Manager prior to actual entry upon the land in order to be apprised of the practices which should be followed or avoided in the conduct of his operations in order to minimize damages to property of the United States.

(Signature)	(Signature of Geophysical Operator)
SAMPLE	
(Address including zip code)	(Address including zip code)

GPO 831-968

SAMPLE

Form 3040–3
(September 1970)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TECHNICAL EXAMINATION CHECKLIST

SURFACE MANAGEMENT REQUIREMENTS FOR EXPLORATION, MINING, AND RECLAMATION

I. BACKGROUND

- ☐ Status, location, and identification of lands affected
- ☐ Adjoining land uses (present and anticipated)
- ☐ Planning and zoning data from local government
- ☐ BLM plans for affected land and environs
- ☐ Anticipated exploration or mining methods

II. RESOURCE VALUES FOR NONMINERAL ENVIRONMENTAL

- ☐ *Livestock:* Range improvements, etc.
- ☐ *Recreation:* Actual use areas, scientific sites, antiquities, and natural areas
- ☐ *Timber:* Dependence of local industry
- ☐ *Watersheds:* Erosion, flooding, water quality, quantity
- ☐ *Fish and Wildlife:* Key game areas, endangered species
- ☐ *Fire:* Added risks from operation or access
- ☐ *Environmental:* Scenic aspects, possible air and noise pollution
- ☐ *Access:* Roads and trails (asset or liability)

III. PUBLIC HEALTH AND SAFETY

- ☐ Toxic materials
- ☐ Fire hazards
- ☐ Landslide potential
- ☐ Hazardous exploration or mine workings
- ☐ Dust
- ☐ Flooding
- ☐ Waste disposal (mine, mill, domestic, etc.)

IV. SOCIO–ECONOMIC CONSIDERATIONS

- ☐ Present and projected demand for the mineral materials
- ☐ Effect on local economy and employment
- ☐ Impact on other resource values (temporary or permanent)

V. ENVIRONMENTAL CONSIDERATIONS AND RECLAMATION REQUIREMENTS

- ☐ Damage to natural scenic, historic, or esthetic features
- ☐ Possible enhancement of future land use by proper reclamation methods; grading, shaping, filling, revegetation, water impoundment, and control
- ☐ Bonding requirements

SAMPLE

GPO 830-735

Form 3120-3
Eleventh Edition
(September 1968)

Form approved
Budget Bureau No. 42-R0990

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Office .....

Serial No. .....

Fill in on typewriter or print plainly in ink and sign in ink.

OFFER TO LEASE AND LEASE FOR OIL AND GAS
(Sec. 17 Noncompetitive Public Domain Lease)

The undersigned hereby offers to lease all or any of the lands described in item 2 that are available for lease, pursuant and subject to the terms and provisions of the Act of February 25, 1920 (41 Stat. 437, 30 U. S. C. sec. 181), as amended, hereinafter referred to as the Act and to all reasonable regulations of the Secretary of the Interior now or hereafter in force, when not inconsistent with any express and specific provisions herein, which are made a part hereof.

1. Mr. / Mrs. / Miss .....
(First Name, Middle Initial, Last Name)

Please notify the signing officer of any change of address.

.....
(Number and Street)

.....
(City, State, ZIP Code)

2. **Land requested:** State | County | T. | R. | Meridian

3. **Land included in lease:** State | County | T. | R. | Meridian | Total Area | Acres

(Offeror does not fill in this block) Total Area Acres Rental retained $

4. Amount remitted: Filing fee $10, Rental $....., Total $.....

5. Undersigned certifies as follows:
(a) Offeror is a citizen of the United States. Native born ..... Naturalized ..... Corporation or other legal entity (specify what kind): .....

(b) Offeror's interests, direct and indirect, do not exceed 200,000 acres in oil and gas options or 246,080 chargeable acres in options, offers to lease and leases in the same State, or 300,000 chargeable acres in leases, offers to lease and options in each leasing district in Alaska. (c) Offeror accepts as a part of this lease, to the extent applicable, the stipulations provided for in 43 CFR 3103.2. (d) Offeror is 21 years of age or over (or if a corporation or other legal entity, is duly qualified as shown by statements made or referred to herein). (e) Offeror has described all surveyed lands by legal subdivisions, all lands covered by protracted surveys by appropriate subdivisions thereof, or all unsurveyed lands not covered by protracted surveys by metes and bounds, and further states that there are no settlers on unsurveyed lands described herein.

6. Offeror ☐ is ☐ is not the sole party in interest in this offer and lease, if issued. (*If not the sole party in interest, statements should be filed as prescribed in Item 6 of the Special Instructions.*)

7. Offeror's signature to this offer shall also constitute offeror's signature to, and acceptance of, this lease and any amendment thereto that may cover any land described in this offer open to lease application at the time the offer was filed but omitted from this lease for any reason, or signature to, or acceptance of, any separate lease for such land. The offeror further agrees that (a) this offer cannot be withdrawn, either in whole or in part, unless the withdrawal is received by the land office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed in behalf of the United States, and (b) this offer and lease shall apply only to lands not within a known geologic structure of a producing oil or gas field.

8. If this lease form does not contain all of the terms and conditions of the lease form in effect at the date of filing, the offeror further agrees to be bound by the terms and conditions contained in that form.

9. It is hereby certified that the statements made herein are complete and correct to the best of offeror's knowledge and belief and are made in good faith.

Offeror duly executed this instrument this ..... day of ....., 19.....

.....
(Lessee signature)

.....
(Lessee signature)

.....
(Attorney-in-fact)

This lease for the lands described in item 3 above is hereby issued, subject to the provisions of the offer and on the reverse side hereof.

THE UNITED STATES OF AMERICA

By .....
(Signing officer)

Effective date of lease ..... (Title) ..... (Date)

THIS OFFER MAY BE REJECTED AND RETURNED TO THE OFFEROR AND WILL AFFORD THE OFFEROR NO PRIORITY IF IT IS NOT PROPERLY FILLED IN AND EXECUTED OR IF IT IS NOT ACCOMPANIED BY THE REQUIRED DOCUMENTS OR PAYMENTS.

18 U. S. C. sec. 1001 makes it a crime for any person knowingly and willfully to make to any Department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

This form may be reproduced provided that the copies are exact reproductions on one sheet of both sides of this official form, in accordance with the provisions of 43 CFR 3123.1(a).

LEASE TERMS

SECTION 4. *Rights of lessee.*—The lessee is granted the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits, except helium gas, in the lands leased, together with the right to construct and maintain thereupon, all works, buildings, plants, waterways, roads, aircraft and means of transportation, all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of 10 years, and so long thereafter as oil or gas is produced in paying quantities; subject to any unit agreement heretofore or hereafter approved by the Secretary of the Interior, the provisions of said agreement to govern the lands subject thereto where inconsistent with the terms of this lease.

SEC. 2. The lessee agrees:

(a) *Bonds.* (1) To file any bond required by this lease and the current regulations and until such bond is filed not to enter on the land under this lease. (2) To maintain any bond furnished by the lessee as a condition for the issuance of this lease. (3) To furnish a bond in a sum double the amount of $2 per acre annual rental, but not less than $1,000 nor more than $10,000, upon the inclusion of any part of the leased land within the known geologic structure of a producing oil or gas field. (4) To furnish prior to beginning of drilling operations and maintain at all times thereafter as required by the lessor a bond in the penal sum of $10,000 with approved corporate surety, or with deposit of United States bonds as surety therefor, conditioned upon compliance with the terms of this lease, unless a bond in that amount is already living maintained or unless such a bond furnished by an operator of the lease is accepted. (5) Until a general lease bond is filed to furnish and maintain a bond in the penal sum of not less than $1,000 in those cases in which a bond is required by law for the protection of the owners of surface rights. In lieu of any of the bonds described herein, the lessee may file such other bond as the regulations may permit.

(b) *Cooperative or unit plan.* Within 30 days of demand, or, if the leased land is committed to an approved unit or cooperative plan and such plan is terminated prior to the expiration of this lease, within 30 days of demand made thereafter, to subscribe to and to operate under such reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof, embracing the lands included herein as the Secretary of the Interior may then determine to be practicable and necessary or advisable which plan shall adequately protect the rights of all parties in interest, including the United States.

(c) *Wells.* (1) To drill and produce all wells necessary to protect the leased land from drainage by wells on lands not the property of the lessor, or lands of the United States leased at a lower royalty rate, or as to which the royalties and rentals are paid at different funds than are those of this lease, or in lieu of any part of such drilling and production, with the consent of the Director of the Geological Survey, to compensate the lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Director; (2) at the election of the lessee, to drill and produce other wells in conformity with any system of well spacing or proration allotments affecting the field or area in which the leased lands are situated, which is authorized and sanctioned by applicable law or by the Secretary of the Interior, and (3) promptly after due notice in writing to drill and produce such other wells as the Secretary of the Interior may reasonably require in order that the leased premises may be properly and timely developed and produced in accordance with good operating practice.

(d) *Rentals and royalties.*—(1) To pay rentals and royalties in amount or value of production removed or sold from the leased lands as follows:

Rentals. To pay the lessor in advance an annual rental at the following rates:

(a) If the lands are wholly outside the known geologic structure of a producing oil or gas field:

(i) For each lease year a rental of 50 cents per acre or fraction of an acre.

(b) If the lands are wholly or partly within the known geologic structure of a producing oil or gas field:

(i) Beginning with the first lease year after 30 days' notice that all or part of the land is included in such a structure and for each year thereafter, prior to a discovery of oil or gas on the lands leased, $2 per acre or fraction of an acre.

(ii) If this lease is committed to an approved cooperative or unit plan which includes a well capable of producing oil or gas and contains a general provision for allocation of production, the rental prescribed for the respective lease years in subparagraph (a) of this section, shall apply to the acreage not within a participating area.

Minimum royalty. Commencing with the lease year beginning on or after a discovery on the leased land, to pay the lessor in lieu of rental, a minimum royalty of $1 per acre or fraction thereof at the expiration of each lease year, or the difference between the actual royalty paid during the year if less than $1 per acre, and the prescribed minimum royalty of $1 per acre, provided that if this lease is extended by the operation of section 17 (i) hereof, the minimum royalty shall be payable only on the participating acreage and rental shall be payable on the nonparticipating acreage as provided in subparagraph (b) (ii) above.

Royalty on production. To pay the lessor 12½ percent royalty on the production removed or sold from the leased lands computed in accordance with the Oil and Gas Operating Regulations (30 CFR Pt. 221).

(2) It is expressly agreed that the Secretary of the Interior may establish reasonable minimum values for purposes of computing royalty on any or all oil, gas, natural gasoline, and other products obtained from gas, due consideration being given to the highest price paid for a part or for a majority of production of like quality in the same field, to the price received by the lessee, to posted prices, and to other relevant matters and, whenever appropriate, after notice and opportunity to be heard.

(3) When paid in value, such royalties on production shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced. When paid in amount of production, such royalty products shall be delivered in merchantable condition on the premises where produced without cost to lessor, unless otherwise agreed to by the parties hereto, at such times and in such tanks provided by the lessee as reasonably may be required by the lessor, but in no case shall the lessee be required to hold such royalty oil or other products in storage beyond the last day of the calendar month next following the calendar month in which produced nor be responsible or held liable for the loss or destruction of royalty oil or other products in storage from causes over which he has no control.

(4) Rentals or minimum royalties may be waived, suspended or reduced and royalties on the entire leasehold or any portion thereof segregated for royalty purposes may be reduced if the Secretary of the Interior finds that, for the purpose of encouraging the greatest ultimate recovery of oil or gas and in the interest of conservation of natural resources, it is necessary, in his judgment, to do so in order to promote development, or because the lessee cannot be successfully operated under the terms fixed herein.

(e) *Payments.* Unless otherwise directed by the Secretary of the Interior to make rental, royalty, or other payments to the lessor, to the order of the Bureau of Land Management at the places mentioned in the regulation 43 CFR 3102.2. If there is no well on the leased lands capable of producing oil or gas in paying quantities, the failure to pay rental on or before the anniversary date shall automatically terminate the lease by operation of law. However, if the time for payment falls on a day in which the proper office is closed, payment shall be deemed timely if made on the next official working day.

(f) *Contracts for disposal of products.* To file with the Oil and Gas Supervisor of the Geological Survey not later than 30 days after the effective date thereof any contract, or evidence of other arrangement, for the sale or disposal of oil or gas, natural gasoline, and other products of the leased land; *Provided*, That nothing in any such contract or other arrangement shall be construed as modifying any of the provisions of this lease, including, but not limited to, provisions relating to gas waste, taking royalty in kind, and the method of computing royalties due as based on a minimum valuation and in accordance with the Oil and Gas Operating Regulations.

(g) *Statements, plats and reports.* At such time and in such form as the lessor may prescribe, to furnish detailed statement showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost; a plat showing development work and improvements on the leased lands; and a report with respect to stockholders, investments, depreciation and costs.

(h) *Well records.*—To keep a daily drilling record, a log, and complete information on all well surveys and tests in form acceptable to or prescribed by the lessor of all wells drilled on the leased lands, and an acceptable record of all subsurface investigations affecting said lands, and to furnish them, or copies thereof, to the lessor when required. All information obtained under this paragraph, upon the request of lessee, shall not be open to inspection by the public until the expiration of the lease.

(i) *Inspection.*—To keep open at all reasonable times for the inspection of any duly authorized officer of the Department, the leased premises and all wells, improvements, machinery, and fixtures thereon and all books, accounts, maps and records relative to operations and surveys or investigations on the leased lands or under the lease. All information obtained pursuant to any such inspection, upon the request of the lessee, shall not be open to inspection by the public until the expiration of the lease.

(j) *Diligence, prevention of waste, health and safety of workmen.* To exercise reasonable diligence in drilling and producing the wells herein provided for unless consent to suspend operations temporarily is granted by the lessor, to carry on all operations in accordance with approved methods and practice as provided in the Oil and Gas Operating Regulations, having due regard for the prevention of waste of oil or gas or damage to deposits or formations containing oil, gas, or water or to coal measures or other mineral deposits, for conservation of gas energy, for the preservation and conservation of the property for future productive operations, and for the health and safety of workmen and employees; to plug properly and effectively all wells drilled in accordance with the provisions of this lease or of any prior lease or permit upon which the right to this lease was predicated before abandoning the same. To carry out at expense of the lessee all reasonable orders of the lessor relative to the matters in this paragraph, and that on failure of the lessee so to do the lessor shall have the right to enter on the property and to perform the purpose of such orders at the lessee's cost: *Provided*, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond lessee's control.

(k) *Taxes and wages, freedom of purchase.* To pay when due, all taxes lawfully assessed and levied under the laws of the State or the United States upon improvements, oil and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(l) *Equal Opportunity clause.* During the performance of this contract the lessee agrees as follows:

(1) The lessee will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The lessee will, in all solicitations or advertisements for employees placed by or on behalf of the lessee, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The lessee will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the lessee's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the lessee's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the lessee may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The lessee will include the provisions of Paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The lessee will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, That in the event the lessee becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the lessee may request the United States to enter into such litigation to protect the interests of the United States.

(m) *Lessee's right of ingress and egress.* As required by applicable law, to file for approval by the lessor any instrument of transfer made of this lease or any interest therein, including assignments of record title, operating agreements and subleases, working or royalty interests, within 90 days from the date of final execution thereof.

(n) *Pipelines to purchase or service at reasonable rates and without discrimination.* If owner, or operator, or owner of a controlling interest in any pipeline or of any company operating the same which may be operated accessible to oil or gas derived from lands under this lease, to accept and convey said oil or gas without discrimination to the lessee or to any citizen or company not the owner of any pipeline, operating a lease or purchasing or selling oil, gas, natural gasoline, or other products under the provisions of the Act, or under the provisions of the Act of August 7, 1947 (61 Stat. 913, 30 U.S.C. sec. 351).

(o) *Lands patented with oil and gas deposits reserved in the United States.*—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(p) *Reserved or segregated lands.* If any of the land included in this lease is embraced in a reservation or segregated for any particular purpose, to conduct operations thereunder in conformity with such requirements as may be made by the Director, Bureau of Land Management, for the protection and use of the land for the purpose for which it was reserved or segregated, so far as may be consistent with the use of the land for the purpose of this lease, which latter shall be regarded as the dominant use unless otherwise provided herein or separately stipulated.

(q) *Protection of surface, natural resources, and improvements.* To take such reasonable steps as may be needed to prevent operations on the leased lands from unnecessarily: (1) causing or contributing to soil erosion or damaging crops, including forage, and timber growth thereon or on Federal or non-Federal lands in the vicinity, (2) polluting air and water, (3) damaging improvements owned by the United States or other parties, or (4) destroying, damaging or removing fossils, historic or prehistoric ruins, or artifacts and upon any partial or total relinquishment or the cancellation or expiration of this lease, or at any other time prior thereto when required and to the extent deemed necessary by the lessor to fill any pits, ditches and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the leased land and access roads to their former condition, including the removal of structures as and if required. The lessor may prescribe the steps to be taken and restoration to be made with respect to the leased lands and improvements thereon whether or not owned by the United States. When American antiquities or other objects of historic or scientific interest including but not limited to historic or prehistoric ruins, fossils or artifacts are discovered in the performance of this lease, the item(s) or conditions(s) will be left intact and immediately brought to the attention of the contracting officer or his authorized representative.

(r) *Overriding royalties.* Not to create overriding royalties in excess of five percent except as otherwise authorized by the regulations.

(s) *Deliver premises in case of forfeiture.* To deliver up to the lessor in good order and condition the land leased including all improvements which are necessary for the preservation of producing wells.

SEC. 3. The lessor reserves:

(a) *Easements and rights-of-way.* The right to permit for joint or several use easements or rights-of-way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same or of other lands containing the deposits described in the Act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) *Disposition of surface.* The right to lease, sell, or otherwise dispose of the surface of the leased lands under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein, or to dispose of any resource in such lands which will not unreasonably interfere with operations under this lease.

(c) *Monopoly and fair prices.* Full power and authority to promulgate and enforce all orders necessary to insure the sale of the production of the leased lands to the United States and to the public at reasonable prices, to protect the interests of the United States, to prevent monopoly, and to safeguard the public welfare.

(d) *Helium.* Pursuant to Section 1 of the Act as amended, the ownership of helium and the right to extract or have it extracted from all gas produced under this lease, subject to such rules and regulations as shall be prescribed by the Secretary of the Interior. If the lessor elects to take the helium, the lessee shall deliver all or any portion of gas containing the same to the lessor, in the manner required by the lessor, at any point on the leased premises, or, if the area is served at the time of production by a gas-gathering system owned or operated by the lessee, at any point in that system specified by the lessor, for extraction of the helium by such means as the lessor may provide. The residue shall be returned to the lessee, with no substantial delay in the delivery of the gas produced from the well to the owner or purchaser thereof. Save for the value of the helium extracted, the lessee shall not suffer a diminution of the value of the gas produced from the well, or loss otherwise, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. The lessor reserves the right to erect, maintain, and operate any and all reduction works necessary for extraction of helium on the leased premises. The lessee further agrees to include in any contract of sale of gas from the lands subject to this lease provisions setting forth that the lessor owns, and reserves the right to extract or have extracted, any helium in the gas sold, and that the lessor may take the gas from a pipeline carrier or any other gas-gathering system and extract the helium and return the gas to the owner thereof, without delay other than that caused by the extraction process; save for the value of the helium, the owner shall not suffer any diminution of the value of the gas from which helium has been extracted, nor any other loss arising from the extraction of helium, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. It is further agreed that any rights reserved vested in the lessor under this paragraph shall also run to any agent or assignee of the lessor or any purchaser of the rights of the lessor.

(e) *Taking of royalties.* All rights pursuant to section 36 of the Act to take royalties in amount or in value of production.

(f) *Coexing.* All rights pursuant to section 40 of the Act to purchase coexing, and lease or operate valuable water wells.

SEC. 4. *Drilling and producing restrictions.* It is agreed that the rate of prospecting and developing and the quantity and rate of production from the lands covered by this lease shall be subject to control in the public interest by the Secretary of the Interior, and in the exercise of his judgment the Secretary may take into consideration, among other things, Federal laws, State laws, and regulations issued thereunder, or lawful agreements among operators regulating either drilling or production, or both. After application the Secretary of the Interior or any person, committee, or State or Federal officer or agency so authorized in the unit plan, may alter or modify from time to time, the rate of prospecting and development and the quantity and rate of production from the lands covered by this lease.

SEC. 5. *Surrender and termination of lease.* The lessee may surrender this lease or any legal subdivision thereof by filing in the proper land office a written relinquishment, in triplicate, which shall be effective as of the date of filing subject to the continued obligation of the lessee and his surety to make payment of all accrued rentals and royalties and to plug all wells on the land to be relinquished in condition for suspension or abandonment in accordance with the applicable lease terms and regulations.

SEC. 6. *Purchase of materials, etc., on termination of lease.* Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessee shall have the privilege at any time within a period of 90 days thereafter of removing from the premises all machinery, equipment, tools, and materials other than improvements needed for producing wells. Any materials, tools, appliances, machinery, structures, and equipment subject to removal as above provided, which are allowed to remain on the leased lands shall become the property of the lessor and no compensation for such extension thereof may be claimed because of allowance of final conditions throughout said period: *Provided*, That the lessee shall remove any or all of such property where so directed by the lessor.

SEC. 7. *Proceedings in case of default.* If the lessee shall not comply with any of the provisions of the Act or the regulations thereunder or of the lease, or make default in the performance or observance of any of the terms hereof (except that of payment of annual rental which results in the automatic termination of the lease), and such default shall continue for a period of 30 days after service of written notice thereof by the lessor, this lease may be cancelled by the Secretary of the Interior in accordance with section 31 of the Act, except that if this lease covers lands known to contain valuable deposits of oil or gas, the lease may be cancelled only by judicial proceedings in the manner provided in section 31 of the Act; but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. Upon cancellation of this lease, any casing, material or equipment left on the premises by the lessee to be necessary for use in plugging or preserving any well drilled on the leased land shall become the property of the lessor. A waiver of any particular cause of cancellation and forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of cancellation and forfeiture, or for the same cause occurring at any other time.

SEC. 8. *Heirs and successors-in-interest.*—It is further agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

SEC. 9. *Unlawful interest.* It is also further agreed that no Member of, or Delegate to, Congress, or Resident Commissioner, after his election or appointment, or either before or after he has qualified and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, except as provided in 43 CFR 7.4(a)(1)(i), shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom; and the provisions of Sec. 3741 of the Revised Statutes of the United States, as amended (41 U.S.C. Sec. 22) and Sec. 431, 432 and 433, Title 18 U.S. Code, relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

INSTRUCTIONS

A. GENERAL INSTRUCTIONS

1. This offer must be filled in on a typewriter or printed plainly in ink and must be signed in ink.

2. This form is to be used in offering to lease noncompetitively public domain lands or oil and gas deposits reserved for the United States in drainage of such lands for the purposes of drilling, mining, extracting, removing and disposing of oil and gas deposits, except helium. This form should not be used in offering to lease acquired land or lands on a known geologic structure of a producing oil or gas field.

3. Offers to lease may be made by individuals 21 years of age or over who are citizens of the United States, and by corporations, partnerships or associations.

4. This offer must be prepared in quintuplicate and filed in the proper land office. The term "filing" means the actual receipt of the offer in the proper land office. If the land is in a State for which there is no land office, the offer must be filed with the Bureau of Land Management, Department of the Interior, Washington, D.C. 20240. See 43 CFR 3123.1(b).

5. If additional space is needed in furnishing any of the required information it should be prepared on additional sheets, initialed and attached and made part of this offer to lease, such additional sheets to be attached to each copy of the form submitted.

6. If any of the land described in Item 2 of the offer is open to oil and gas lease filing when the offer is filed but is omitted from the lease for any reason and thereafter becomes available for leasing to the offeror, the original lease will be amended to include the omitted land, unless, before the issuance of the amendment on Form 3120-4, the land office receives the withdrawal of the offer as to such land or an election to receive a separate lease to be dated in accordance with 43 CFR 3123.2, in which case such separate lease will be issued. If the lease is amended the rental charged and the lease term will be the same as though the added land had been included in the original lease when it was issued.

7. As an incident to the assignment of the whole interest in all or any part of the lease, the lessee may assign the whole interest in all or any part of the offer. As an incident to the assignment of an undivided fractional interest in the whole lease, the lessee may assign an undivided fractional interest in the whole offer. Applications for approval of assignments of an offer must include a statement that the assignee agrees to be bound by the offer to the extent it is assigned and must be signed by the assignee. In other instances assignments of the offer will not be approved prior to the issuance of a lease for the lands or deposits covered by said assignments.

8. The offer will be rejected and returned to the offeror and will afford the applicant no priority if not filed in accordance with the appropriate regulations.

B. SPECIAL INSTRUCTIONS[1]

Item 2. Total area of land requested should be shown in acres in space provided at bottom of Item 2. That area, except where the rule of approximation applies, must not exceed 2,560 acres or be less than 640 acres or the equivalent of a section except as provided in 43 CFR 3123.1(d). All of the land must be within a 6-mile square or an area of 6 surveyed sections in length or width. The description of surveyed and unsurveyed lands, or lands covered by protracted surveys must conform to the provisions of 43 CFR 3122.2.

Item 3. This space is not to be filled in. When lease is issued this space will contain the identification of the leased area and total acres.

Item 4. The total amount remitted should include a $10 filing fee and the first year's rental of the land requested at the rate of 50 cents an acre or fraction thereof, any fraction being rounded as an additional acre. The $10 filing fee is retained as a service charge, even in those cases where the offer is completely rejected. In order to protect the offeror's priorities with respect to the land requested, it is important that the rental payment submitted with the offer be sufficient to cover all the land requested at the rate of 50 cents an acre or fraction thereof. If the land requested includes lots or irregular quarter-quarter sections, the exact area of which is not known to the offeror, rental may be submitted for the purpose of the offer on the basis of each such lot or quarter-quarter section containing 40 acres. If the offer is withdrawn in whole or in part before a lease is issued or if the offer is rejected in whole or in part, the rental remitted for the parts withdrawn or rejected will be returned.

Item 5 (a).—Offeror will indicate whether a citizen by birth or naturalization. If production is obtained under this lease or allocated to it, the citizenship status of the lessee will be verified.

If offeror is an unincorporated association (including a partnership), the offer must be accompanied by a statement giving the name, showing as to citizenship and holdings of its members as required of an individual.

If offeror is a corporation it must submit a statement containing the following information: the State in which it is incorporated, that it is authorized to hold oil and gas leases and that the officer executing the lease is authorized to act on behalf of the corporation in such matters. The percentage of the voting stock and of all of the stock owned by aliens or those having addresses outside the United States. Where such ownership is over 10 percent, additional information may be required by the Bureau before the lease is issued or when production is obtained. If 10 percent or more of the stock of any class is owned or controlled by or on behalf of any one stockholder a separate showing of his citizenship and holdings must be furnished. Where such material has been previously filed, a reference by serial number to the records in which it has been filed, together with a statement of any amendments, will be accepted.

Item 5 (b). Acreage included in unitized leases and leases subject to certain development contracts approved by the Secretary under authority of Section 17(b) is not chargeable.

Item 5 (c). Whenever applicable the stipulations referred to will be made a part of this lease and will be furnished the lessee with the lease when issued. The forms covering them with a brief description are as follows: 3103-2 Stipulations for lands where the surface rights are under the jurisdiction of the Department of Agriculture; 3103-1 Lands potentially irrigable, lands within the flow limits of a reservoir site, lands within the drainage area of a constructed reservoir; 3500-1 Lands withdrawn for power purposes; and 3120-3 Wildlife Refuge, Game Range, and Coordination Lands. Whenever other stipulations are necessary, lessee will be required to agree to them before the issuance of the lease.

Item 5 (e). If there are settlers, attach a sheet giving the name and post office address of each and description of the lands claimed by metes and bounds or protracted surveys and approximate legal subdivisions.

Item 6. Offeror must indicate whether or not he is the sole party in interest in this offer and the lease, if issued. If not the sole party in interest, the offeror must submit at the time the offer is filed a signed statement setting forth the names of the other interested parties. If there are other parties interested in the offer, a separate statement must be signed by them and the offeror, setting forth the nature and extent of the interest of each, the nature of the agreement between them if oral, and a copy of the agreement if written. Such separate statement and written agreement, if any, must be filed within 15 days after the filing of the lease offer. All interested parties must furnish evidence of their qualifications to hold such lease interests.

[1] Items numbered according to numbers on offer form.

Form 3110–3
(September 1973)
(formerly 3200–3)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Form approved.
Budget Bureau No. 42–R1140.

Office .....

Serial No. .....

Fill in on typewriter or print plainly in ink and sign in ink.

OFFER TO LEASE AND LEASE FOR OIL AND GAS
NONCOMPETITIVE ACQUIRED LANDS LEASE

The undersigned hereby offers to lease all or any of the lands described in item 2 that are available for lease, pursuant and subject to the terms and provisions of the Act of August 7, 1947 (61 Stat. 913; 30 U.S.C. 351–359), hereinafter referred to as the Act, and to all reasonable regulations of the Secretary of the Interior now or hereafter in force, when not inconsistent with any express and specific provisions herein, which are made a part hereof.

1. Mr. / Mrs. / Miss .....
(First Name, Middle Initial, Last Name)

Please notify the signing officer of any change of address.

.....
(Number and Street)

.....
(City, State, ZIP Code)

2. Land requested: State ____ County ____ T. ____ : R. ____ : Meridian ____

U.S. interest if less than 100 percent

Total area ..... acres

3. Land included in lease: State ____ County ____ T. ____ : R. ____ : Meridian ____

U.S. interest if less than 100 percent

Total area ..... acres

Net area for rental ..... acres

(Offeror does not fill in this block) Rental retained $.....

4. Amount remitted: Filing fee $10, Rental $....., Total $.....

5. Undersigned certifies as follows:

(*a*) Offeror is a citizen of the United States. ☐ Yes ☐ No

Corporation or other legal entity (specify what kind): .....

.....

(*b*) Agency having administrative control over surface use of land, and unit or project of which land is a part are

.....

(*c*) Offeror's interests, direct and indirect, in acquired lands do not exceed 200,000 acres in oil and gas options or 246,080 chargeable acres in options, offers to lease and leases in the same State, or 300,000 chargeable acres in leases, offers to lease and options in each leasing district in Alaska.

(*d*) Offeror accepts as a part of this lease, to the extent applicable, the stipulations provided for in 43 CFR 3103.2.

(*e*) Offeror is 21 years of age or over (or if a corporation or other legal entity, is duly qualified to receive a lease as shown by statements made or referred to herein).

(*f*) Offeror has described all lands as provided for in 43 CFR 3212.1.

6. Offeror ☐ is ☐ is not the sole party in interest in this offer and lease, if issued. (*If not the sole party in interest, statements should be filed as prescribed in Item 6 of the Special Instructions.*)

7. Offeror's signature to this offer shall also constitute offeror's signature to, and acceptance of, this lease and any amendment thereto that may cover any land described in this offer open to lease application at the time the offer was filed but omitted from this lease for any reason, or signature to, or acceptance of, any separate lease for such land. The offeror further agrees that (*a*) this offer cannot be withdrawn, either in whole or in part, unless the withdrawal is received by the land office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed in behalf of the United States, and (*b*) this offer and lease shall apply only to lands not within a known geologic structure of a producing oil or gas field.

8. If this lease form does not contain all of the terms and conditions of the lease form in effect at the date of filing, the offeror further agrees to be bound by the terms and conditions contained in that form.

9. It is hereby certified that the statements made herein are complete and correct to the best of offeror's knowledge and belief and are made in good faith.

Offeror duly executed this instrument this ..... day of ....., 19.....

.....
(Lessee signature)

.....
(Lessee signature)

.....
(Attorney-in-fact)

This lease for the lands described in item 3 above is hereby issued, subject to the provisions of the offer and on the reverse side hereof.

THE UNITED STATES OF AMERICA

By .....
(Signing officer)

Effective date of lease ..... (Title) ..... (Date)

THIS OFFER MAY BE REJECTED AND RETURNED TO THE OFFEROR AND WILL AFFORD THE OFFEROR NO PRIORITY IF IT IS NOT PROPERLY FILLED IN AND EXECUTED OR IF IT IS NOT ACCOMPANIED BY THE REQUIRED DOCUMENTS OR PAYMENTS.

18 U.S.C. 1001 makes it a crime for any person knowingly and willfully to make to any Department or Agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

This form may be reproduced provided that the copies are exact reproductions on one sheet of both sides of this official form, in accordance with the provisions of 43 CFR 3212.4.

LEASE TERMS

Section 1. *Rights of lessee.*—The lessee is granted the exclusive right and privilege to drill for, mine, extract, remove, and dispose of all the oil and gas deposits, except helium gas, in the lands leased, together with the right to construct and maintain thereupon, all works, buildings, plants, waterways, roads, telegraph or telephone lines, pipelines, reservoirs, tanks, pumping stations, or other structures necessary to the full enjoyment thereof, for a period of 10 years, and so long thereafter as oil or gas is produced in paying quantities; subject to any unit agreement heretofore or hereafter approved by the Secretary of the Interior, the provisions of said agreement to govern the lands subject thereto where inconsistent with the terms of this lease.

Sec. 2. The lessee agrees:

(a) *Bonds.*—(1) To file any bond required by this lease and the current regulations and until such bond is filed not to enter on the land under this lease. (2) To maintain any bond furnished by the lessee as a condition for the issuance of this lease. (3) To furnish a bond in a sum double the amount of $2 per acre annual rental, but not less than $1,000 nor more than $10,000, upon the inclusion of any part of the leased land within the known geologic structure of a producing oil or gas field. (4) To furnish prior to beginning of drilling operations and maintain at all times thereafter as required by the lessor a bond in the penal sum of $10,000 with a qualified surety, or with deposit of United States bonds as surety therefor, conditioned upon compliance with the terms of this lease, unless a bond in that amount is already being maintained or unless such a bond furnished by an operator of the lease is accepted. (5) Until a general bond is filed to furnish and maintain a bond in the penal sum of not less than $1,000 in those cases in which a bond is required by law for the protection of the owners of surface rights. In lieu of any of the bonds described herein, the lessee may file such other bond as the regulations may permit.

(b) *Cooperative or unit plan.*—Within 30 days of demand, or, if the leased land is committed to an approved unit or cooperative plan and such plan is terminated prior to the expiration of this lease, within 30 days of demand made thereafter, to subscribe to and to operate under such reasonable cooperative or unit plan for the development and operation of the area, field, or pool, or part thereof, embracing the lands included herein as the Secretary of the Interior may then determine to be practicable and necessary or advisable, which plan shall adequately protect the rights of all parties in interest, including the United States.

(c) *Wells.*—(1) To drill and produce all wells necessary to protect the leased land from drainage by wells on lands not the property of the lessee, or lands of the United States leased at a lower royalty rate, or as to which the royalties and rentals are paid into different funds than are those of this lease; or in lieu of any part of such drilling and production, with the consent of the Director of the Geological Survey, to compensate the lessor in full each month for the estimated loss of royalty through drainage in the amount determined by said Director; (2) at the election of the lessee, to drill and produce other wells in conformity with any system of well spacing or production allotments affecting the field or area in which the leased lands are situated, which is authorized and sanctioned by applicable law or by the Secretary of the Interior; and (3) promptly after due notice in writing to drill and produce such other wells as the Secretary of the Interior may reasonably require in order that the leased premises may be properly and timely developed and produced in accordance with good operating practice.

(d) *Rentals and royalties.*—(1) To pay rentals and royalties in amount or value of production removed or sold from the leased lands as follows:

Rentals.—To pay the lessor in advance an annual rental at the following rates:

(a) If the lands are wholly outside the known geologic structure of a producing oil or gas field:

(i) For each lease year a rental of 50 cents per acre or fraction of an acre.

(b) If the lands are wholly or partly within the known geologic structure of a producing oil or gas field:

(i) Beginning with the first lease year after 30 days' notice that all or part of the land is included in such a structure and for each year thereafter, prior to a discovery of oil or gas on the lands leased, $2 per acre or fraction of an acre.

(ii) If the leased lease is committed to an approved cooperative or unit plan which includes a well capable of producing oil or gas and contains a general provision for allocation of production, the rental prescribed for the respective lease years in subparagraph (a) of this section, shall apply to the acreage not within a participating area.

Minimum royalty.—Commencing with the lease year beginning on or after a discovery on the leased land, to pay the lessor in lieu of rental a minimum royalty of $1 per acre or fraction thereof at the expiration of each lease year, or the difference between the actual royalty paid during the year if less than $1 per acre, and the prescribed minimum royalty of $1 per acre: *Provided*, That if this lease is within the minimum royalty shall be payable only on the participating acreage and rental shall be payable on the nonparticipating acreage as provided in subparagraph (b) (ii) above.

Royalty on production.—To pay the lessor 12½ percent royalty on the production removed or sold from the leased lands computed in accordance with the Oil and Gas Operating Regulations (30 CFR 221).

(2) It is expressly agreed that the Secretary of the Interior may establish reasonable minimum values for purposes of computing royalty on any or all oil, gas, natural gasoline, and other products obtained from gas, due consideration being given to the highest price paid for a part or for a majority of production of like quality in the same field, to the price received by the lessee, to posted prices, and to other relevant matters and, whenever appropriate, after notice and opportunity to be heard.

(3) When paid in value, such royalties on production shall be due and payable monthly on the last day of the calendar month next following the calendar month in which produced. When paid in amount of production, such royalty products shall be delivered in merchantable condition on the premises where produced without cost to lessor, unless otherwise agreed to by the parties hereto, at such times and in such tanks as may be prescribed by the lessee, but in no case shall the lessee be required to hold such royalty oil or other products in storage beyond the last day of the calendar month next following the calendar month in which produced nor be responsible or held liable for the loss or destruction of royalty oil or other products in storage from causes over which he has no control.

(4) Rentals or minimum royalties may be waived, suspended or reduced and royalties on the entire leasehold, or any portion thereof, reduced, or royalty purposes may be reduced if the Secretary of the Interior finds that, for the purpose of encouraging the greatest ultimate recovery of oil or gas and in the interest of conservation of natural resources, it is necessary, in his judgment, to do so in order to promote development, or because the lease cannot be successfully operated under the terms fixed herein.

(e) *Payments.*—Unless otherwise directed by the Secretary of the Interior, to make rental, royalty, or other payments to the lessor, to the order of the Bureau of Land Management at the places mentioned in the regulations (43 CFR 3102.2). If there is no well on the leased lands capable of producing oil or gas in paying quantities, the failure to pay rental on or before the anniversary date shall automatically terminate the lease by operation of law. However, if the time for payment falls on a day on which the proper office for payment is not open for business, payment shall be deemed timely if made on the next official working day.

(f) *Contracts for disposal of products.*—To file with the Oil and Gas Supervisor of the Geological Survey not later than 30 days after the effective date hereof any contract, or evidence of other arrangement, for the sale or disposal of oil, gas, natural gasoline, and other products of the leased land: *Provided*, That nothing in any such contract or other arrangement shall be construed as modifying any of the provisions of this lease, including but not limited to, any provisions relating to gas not taken, taking royalty in kind, and the method of computing royalties due as based on a minimum valuation and in accordance with the Oil and Gas Operating Regulations.

(g) *Statements, plats, and reports.*—At such times and in such form as the lessor may prescribe, to furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost; a plat showing development work and improvements on the leased lands; and a report with respect to stockholders, investments, depreciation, and costs.

(h) *Well records.*—To keep a daily drilling record, a log, and complete information on all well surveys and tests in form acceptable to or prescribed by the lessor of all wells drilled on the leased lands, and an acceptable record of all subsurface investigations affecting said lands, and to furnish them, or copies thereof, to the lessor when requested; information obtained under this paragraph, upon the request of the lessee, shall not be open to inspection by the public until the expiration of the lease.

(i) *Inspection.*—To keep open at all reasonable times for the inspection of any duly authorized officer of the Department, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations and surveys or investigations on the leased lands or under the lease. All information obtained pursuant to any such inspection, upon the request of the lessee, shall not be open to inspection by the public until the expiration of the lease.

(j) *Diligence, prevention of waste, health and safety of workmen.*—To exercise reasonable diligence in drilling and producing the wells herein provided for, unless consent to suspend operations temporarily is granted by the lessor; to carry on all operations in accordance with approved methods and practice as provided in the Oil and Gas Operating Regulations, having due regard for the prevention of waste of oil or gas or damage to deposits thereof, to the contiguous oil, gas, or water or to coal measures or other mineral deposits, for conservation of gas energy, for the preservation and conservation of the property for future productive operations, and for the health and safety of workmen and employees; to plug properly and effectively all wells drilled in accordance with the provisions of this lease or of any prior lease or permit upon which the right to this lease was predicated before abandoning the same; to carry out at expense of the lessee all reasonable orders of the lessor relative to the matters in this paragraph in failure of the lessee to do so the lessor shall have the right to enter on the property and to accomplish the purpose of such orders at the lessee's cost: *Provided*, That the lessee shall not be held responsible for delays or casualties occasioned by causes beyond the lessee's control.

(k) *Taxes and wages, freedom of purchase.*—To pay when due, all taxes lawfully assessed and levied under the laws of the State or the United States upon improvements, oil and gas produced from the lands hereunder, or other rights, property, or assets of the lessee; to accord all workmen and employees complete freedom of purchase, and to pay all wages due workmen and employees at least twice each month in the lawful money of the United States.

(l) *Equal opportunity clause.*—During the performance of this contract, the lessee agrees as follows:

(1) The lessee will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The lessee will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The lessee agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The lessee will, in all solicitations or advertisements for employees placed by or on behalf of the lessee, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The lessee will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the lessee's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The lessee will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the lessee's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the lessee may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The lessee will include the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The lessee will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: *Provided, however*, That in the event the lessee becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the lessee may request the United States to enter into such litigation to protect the interests of the United States.

(m) *Assignments of oil and gas leases or interest therein.*—As required by applicable law, to file for approval by the lessor any instrument of transfer made of this lease or any interest therein, including assignments of record title, operating agreements and subleases, working or royalty interests, within 90 days from the date of final execution thereof.

(n) *Pipelines to purchase or convey at reasonable rates and without discrimination.*—If owner, or operator, or owner of a controlling interest in any pipeline or any company operating the same which may be operated accessible to oil or gas derived from lands under this lease, to accept and convey and, if a purchaser of such products, to purchase at reasonable rates and without discrimination the oil or gas of the Government or of any citizen or company not the owner of any pipeline operating the lease or controlled by the owner thereof; and to purchase all such products under the provisions of the Act, or under the provisions of the Act of February 25, 1920 (41 Stat. 437, 30 U.S.C. 181).

(o) *Reserved deposits.*—To comply with all statutory requirements and regulations thereunder, if the lands embraced herein have been or shall hereafter be disposed of under the laws reserving to the United States the deposits of oil and gas therein, subject to such conditions as are or may hereafter be provided by the laws reserving such oil or gas.

(p) *Damage to property.*—To pay the lessor or his tenant, as the case may be, for damage to crops or destruction of property caused by lessee's operations hereunder, to save and hold the lessor harmless from all damage or claims for damage to persons or property resulting from the lessee's operations under this lease; and where the surface of the leased land is owned by other than the lessor, to pay such owner or his tenant, as the case may be, for damage or injury to grass, crops, trees, pipelines, buildings, and other improvements on the leased land.

(q) *Protection of the surface, natural resources, and improvements.* The lessee agrees that he will take all reasonable steps to prevent operations, including operation of operating plants on the leased premises, from unnecessarily: (1) causing or contributing to soil erosion or damaging any forage and timber growth on the leased lands or on Federal or non-Federal lands in the vicinity; (2) polluting air and water; (3) damaging crops, including forage, timber, or improvements of surface owners; (4) damaging improvements whether owned by the United States or by its permittees or lessees; or (5) destroying, damaging, or removing fossil, historic or prehistoric ruins or artifacts and upon any partial or total relinquishment of the cancellation or expiration of this lease, or at any other time prior thereto when required and to the extent directed necessary by the lessor to fill any sump holes, ditches, and other excavations, remove or cover all debris, and, so far as reasonably possible, restore the surface of the leased lands and access roads to their former state, including the removal of structures as may if required. The lessee may thereafter be the right to be taken and reclamation to be made with respect to the leased lands and improvements thereon, whether or not owned by the United States.

(r) *Overriding royalties.*—Not to create overriding royalties in excess of five percent except as otherwise authorized by the regulations.

(s) *Delivery premises in case of forfeiture.*—To deliver up to the lessor in good order and condition the land leased including all improvements which are necessary for the preservation of producing wells.

Sec. 3. The lessor reserves:

(a) *Easements and rights-of-way.*—The right to permit for joint or several use easements or rights-of-way, including easements in tunnels upon, through, or in the lands leased, occupied, or used as may be necessary or appropriate to the working of the same and other lands containing the deposits described in the Act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees, and for other public purposes.

(b) *Disposition of surface.*—The right to lease, sell, or otherwise dispose of the surface of the leased lands under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein, or to dispose of any resource in such lands which will not unreasonably interfere with operations under this lease.

(c) *Monopoly and fair prices.*—Full power and authority to promulgate and enforce all orders necessary to insure the sale of the production of the leased lands to the United States and to the public at reasonable prices, to protect the interests of the United States, to prevent monopoly, and to safeguard the public welfare.

(d) *Helium.*—Pursuant to Section 1 of the Act as amended, the ownership of helium and the right to extract or have it extracted from all gas produced under this lease, subject to such rules and regulations as shall be prescribed by the Secretary of the Interior. If the lessor elects to take the helium, the lessee shall deliver all or any portion of gas containing the same to the lessor, in the manner required by the lessor, at any point on the leased premises, or if the gas is sold at the time of production by a gas-gathering system owned or operated by the lessee, at any point in that system specified by the lessee, for extraction of the helium by such means as the lessor may provide. The residue shall be returned to the lessee, with no substantial delay in the delivery of the gas produced from the well to the owner or purchaser thereof. Save for the value of the helium extracted, the lessee shall not suffer a diminution of the value of the gas produced from the well, or loss otherwise, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. The lessor reserves the right to erect, maintain, and operate any and all reduction works necessary for extraction of helium on the leased premises. The lessee further agrees to include in any contract of sale of gas from the lands subject to this lease provisions setting forth that the lessor owns, and reserves the right to extract or have extracted, any helium in the gas sold, and that the lessee may take the gas from a pipeline carrier or any other gas-gathering system and extract the helium and return the gas to the owner thereof, without delay other than that caused by the extraction process; save for the value of the helium, the owner shall not suffer any diminution of the value of the gas from which helium has been extracted, or any other loss arising from the extraction of helium, including any expense caused solely by the requirement of the delivery of the gas to permit the extraction of helium, for which he is not reasonably compensated. It is further agreed that any rights reserved vested in the lessor under this paragraph shall also run to any agent or assignee of the lessor or any purchaser of the rights of the lessor.

(e) *Taking of royalties.*—All rights pursuant to Section 36 of the Act of February 25, 1920 (41 Stat. 451; 30 U.S.C. 192), to take royalties in amount or in value of production.

(f) *Casing.*—In case the lessee strikes water while drilling instead of oil or gas, or abandons a well drilled as a water well, the right to purchase the casing in any such well at the reasonable salvage value thereof.

Sec. 4. *Undivided fractional interest.*—Where the interest of the United States in the oil and gas underlying any tract or tracts described in item 3 on the reverse hereof is an undivided fractional interest, the following terms and conditions shall apply:

(a) Rentals and royalties payable on account of each such tract shall be in the same proportion to the rentals and royalties provided in Section 2(d) hereof as the undivided fractional interest of the United States in the oil and gas underlying such tract is to the full fee simple interest.

(b) If, during the period this lease is in effect, the lessee owns or holds under this lease undivided fractional interests in oil and gas underlying such tract, the right of the lessor to extract helium in accordance with Section 3(d) of this lease shall extend to all gas produced on the basis of such ownership or lease.

Sec. 5. *Drilling and producing restrictions.* It is agreed that the rate of prospecting and developing, and the quantity and rate of production from the lands covered by this lease, shall be subject to control in the public interest by the Secretary of the Interior, and in the event of any dispute the Secretary shall take into consideration, among other things, Federal laws, State laws, and regulations issued thereunder, or lawful agreements among operators regulating either drilling or production, or both. After unitization, the Secretary of the Interior, or any person, committee, or State or Federal officer or agency so authorized by him, may alter or modify, from time to time, the rate of prospecting and development and the quantity and rate of production from the lands covered by this lease.

Sec. 6. *Surrender and termination of lease.* The lessee may surrender this lease or any legal subdivision thereof by filing in the proper land office a written relinquishment, in triplicate, which shall be effective as of the date of filing subject to the continued obligation of the lessee and his surety to make payment of all accrued rentals and royalties and to plug all wells on the land to be relinquished in condition for suspension or abandonment in accordance with the applicable lease terms and regulations.

Sec. 7. *Removal of materials, etc., on termination of lease.* Upon the expiration of this lease, or the earlier termination thereof pursuant to the last preceding section, the lessee shall have the privilege at any time within a period of 90 days thereafter of removing from the premises all machinery, equipment, tools, and materials other than improvements needed for producing wells in any material, tools, appliances, machinery, structures, and equipment subject to removal as above provided, which are allowed to remain on the leased lands shall become the property of the lessor on expiration of the 90-day period or such extension thereof as may be granted because of adverse physical conditions or unusual hardship: *Provided*, That the lessee shall remove any or all of such property where so directed by the lessor.

Sec. 8. *Proceedings in case of default.* If the lessee shall not comply with any of the provisions of the Act or the regulations thereunder, or of the lease, or default in the performance or observance of any of the terms hereof (except that of payment of annual rental which results in the automatic termination of the lease), and such default shall continue for a period of 30 days after service of written notice by the lessor, this lease may be cancelled by the Secretary of the Interior in accordance with Section 31 of the Act of February 25, 1920 (41 Stat. 450; 30 U.S.C. 1683, as amended), except that if this lease covers lands known to contain valuable deposits of oil or gas the lease may be cancelled only by judicial proceedings in the manner provided in Section 31 of the Act of February 25, 1920, *supra*, but this provision shall not be construed to prevent the exercise by the lessor of any legal or equitable remedy which the lessor might otherwise have. Upon cancellation of this lease, any casing, material, or equipment determined by the lessor to be necessary for the conservation of any well drilled on the leased land shall become the property of the lessor. A waiver of any particular cause of forfeiture shall not prevent the cancellation and forfeiture of this lease for any other cause of forfeiture, or for the same cause occurring at any other time.

Sec. 9. *Heirs and successors-in-interest.* It is further agreed that each obligation hereunder shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 10. *Unlawful interest.*—It is also further agreed that no Member of, or Delegate to, Congress, or Resident Commissioner after his election or appointment, or either before or after he has qualified and during his continuance in office, and that no officer, agent, or employee of the Department of the Interior, except as provided in 43 CFR 7.4(a)(1), shall be admitted to any share or part in this lease or derive any benefit that may arise therefrom, and the provisions of Section 3741 of the Revised Statutes of the United States, as amended (41 U.S.C. 22), and Sections 431, 432, and 433, Title 18, U.S. Code, relating to contracts, enter into and form a part of this lease so far as the same may be applicable.

INSTRUCTIONS

A. GENERAL INSTRUCTIONS

1. This offer should be typewritten or printed plainly in ink and must be signed in ink.

2. This form is to be used in offering to lease noncompetitively lands acquired by the United States which are subject to lease under the Act of August 7, 1947, for the purpose of drilling, mining, extracting, removing, and disposing of oil and gas deposits except helium, and in which the United States has a present leasing interest, whether partial or whole. 43 CFR 3211.1 specifies the lands to which this Act does not apply. This form should not be used in offering to lease lands on a known geologic structure of a producing oil and gas field, or public domain lands, or acquired lands in which the Government has a fractional interest.

3. Offers to lease may be made by individuals 21 years of age or over, or by legal guardian or trustee of minors and incompetents who are citizens of the United States, and by corporations, partnerships or associations.

4. Seven copies of the offer must be prepared and filed in the proper land office. See the regulations 43 CFR 1821.2-1 for the location of such offices. The term "filing" means the actual receipt of the offer.

5. If additional space is needed in furnishing any of the required information, it should be prepared on additional sheets, initialed and attached and made part of this offer to lease, such additional sheets to be attached to each copy of the form as executed.

6. If any of the land described in item 2 of the offer, is open to oil and gas lease filing when the offer is filed but is omitted from the lease for any reason and thereafter becomes available for leasing to the offeror, the original lease will be amended to include the omitted land unless, before the issuance of the amendment on Form 3120 4, the land office receives the withdrawal of the offer as to such land or an election to receive a separate lease for such land in accordance with 43 CFR 3122.2, in which case such separate lease will be issued. If the lease is amended the rental charged and the lease term will be the same as though the added land had been included in the original lease when it was issued.

7. As an incident to the assignment of the whole or interest in all or any part of the lease, the lessee may assign the whole or interest in all or any part of the offer. As an incident to the assignment of an undivided fractional interest in the whole lease, the lessee may assign an undivided fractional interest in the whole offer. Application for approval of assignments of an offer must include a statement that the assignee agrees to be bound by the offer to the extent it is assigned and must be signed by the assignee. In no instance unless assignments of the offer will not be approved prior to the issuance of a lease for the lands or deposits covered by said assignments.

8. The offer will be rejected and returned to the offeror and will afford the applicant no priority if not filed in accordance with the appropriate regulations.

B. SPECIAL INSTRUCTIONS*

Item 2.—Total area of land requested should be shown in acres in space provided at bottom of item 2. That area, except where the rule of approximation applies, must not exceed 2,560 acres. All of the land must be within a 6-mile square of an area of 8 surveyed sections in length or width. The description of surveyed and unsurveyed lands must conform to the provisions of 43 CFR 3212.1. In instances where the United States does not own a 100-percent interest in the oil and gas deposits in any particular tract, the offeror should indicate the percentage of Government ownership. In such cases the offeror must also furnish the information required by 43 CFR 3212.3.

Item 3. This space is not to be filled in. When lease is issued, this space will contain a description of the lands in which the interest of the United States in the oil and gas deposits in each tract where such interest is less than 100 percent, the total area and the net area for which rental is charged. If the interest of the United States in the oil and gas power to be leased is smaller than the interest stated, the rentals and royalties payable by the lessee shall be increased or decreased proportionately.

Item 4. The total amount remitted should include a $10 filing fee and the first year's rental on the land requested at the rate of 50 cents per acre or fraction thereof, if the United States owns a 100-percent interest in the oil and gas deposits. If the interest is less than 100 percent, rental should be paid in the proportion outlined in Section 4(a) of the Lease Terms. The full rental payment should accompany the offer even though the mineral interest of the United States is subject to a royalty interest which may, during its duration, have the effect of diminishing the royalty payable to the United States. Such lease when issued will be subject to the royalty interest. The $10 filing fee is retained or a survey charge, even in those cases where the offer to lease is completely rejected. In order to protect the offeror's priorities with respect to the land requested, it is important that the rental payment submitted with the offer be sufficient to cover all the land requested at the rates indicated above. If the land requested includes lots or irregular quarter-quarter sections the exact area of which is not known to the offeror, rental may be submitted for the purpose of the offer on the basis of 40 acres for lots or quarter-quarter sections containing 40 acres or more. The computed acreage included with a metes and bounds description. If the offer is withdrawn in whole or in part before a lease is issued, or if the offer is rejected in whole or in part, the rental remitted for the parts withdrawn or rejected will be returned. Where at the time the lease is to be issued, the land applied for or any part of it is within a known geologic structure of a producing oil or gas field, the lessee will be billed for the additional rental of $1.50 an acre on all the leased land and as the yearly rental on such lands is $2 per acre.

Item 5(a).—Offeror will indicate whether or not he is the sole party in interest in this offer and the lease is issued. If not the sole party in interest, the offeror must file with his offer a statement setting forth the names of the other interested parties. If there are other parties interested in the offer, a separate statement must be signed by them and the offeror, setting forth the nature and extent of the interest of each, the nature of the agreement between them if oral and a copy of the agreement if written. Such separate statement and written agreement, if any, must be filed within 15 days after the filing of the lease offer. All interested parties must furnish evidence of their qualifications to hold such lease interest.

Item 5(b). If practicable, the offeror should indicate the agency having control over the surface use of the land and the unit or project of which the land is a part.

Item 5(d). Whenever applicable the stipulations referred to will be made a part of this lease and will be furnished the lessee with the lease when issued. The forms covering them with a brief description are as follows: 3103-2 Stipulations for lands where the surface is administered by the jurisdiction of the Department of Agriculture. 3109-1 Lands potentially irrigable lands within the flow limits of a reservoir site, lands within the drainage area of a contemplated reservoir. 3120-2 Wildlife Refuge, Game Range, and Recreation Lands and 3500-1 Lands withdrawn for power development. Where other stipulations are necessary, lessee will be required to agree to them before the issuance of the lease.

Item 6. Offeror must indicate whether or not he is the sole party in interest in this offer and the lease is issued. If not the sole party in interest, the offeror must file with his offer a statement setting forth the names of the other interested parties. If there are other parties interested in the offer, a separate statement must be signed by them and the offeror, setting forth the nature and extent of the interest of each, the nature of the agreement between them if oral and a copy of the agreement if written. Such separate statement and written agreement, if any, must be filed within 15 days after the filing of the lease offer. All interested parties must furnish evidence of their qualifications to hold such lease interest.

*Items numbered according to numbers on offer form.

Form 3104–8
(February 1971)
(formerly 3120–20)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

STATE OR NATIONWIDE OIL AND GAS BOND

Act of February 25, 1920 (30 U.S.C. Sec. 181);
Act of August 7, 1947 (30 U.S.C. Sec. 351)

KNOW ALL MEN BY THESE PRESENTS, That we

of

,

as principal, and
of ,
as surety, are held and firmly bound unto the United States of America in the sum of
dollars ($), lawful money of the United States, which sum may be increased or decreased by a rider hereto executed in the same manner as this bond, for the use and benefit of (1) the United States; (2) the owner of any of the land subject to the coverage of this bond, who has a statutory right to compensation in connection with a reservation of the oil and gas deposits to the United States; and (3) any lessee or permittee under a lease or permit issued by the United States prior to the issuance of an oil and gas lease for the same land subject to this bond, covering the use of the surface or the prospecting for, or development of, other mineral deposits in any portion of such land, to be paid to the United States. For such payment, well and truly to be made, we bind ourselves, and each of our heirs, executors, administrators, successors and assigns, jointly and severally.

If the amount of this bond is $150,000 or if it is increased to that amount, the coverage shall extend to all of the principal's holdings of federal oil and gas leases in the United States, including Alaska, under the Acts cited in Schedule A.

If the amount of this bond is less than $150,000, its coverage extends only to the principal's holdings of federal oil and gas leases in the States named in Schedule A and to any other State or States that may be named in a rider attached hereto by the lessor with the consent of the surety.

SCHEDULE A

Public Domain Leasing Act of February 25, 1920 (30 U.S.C. Sec. 181)	Acquired Lands Leasing Act of August 7, 1947 (30 U.S.C. Sec. 351)
NAMES OF STATES	NAMES OF STATES

The conditions of the foregoing obligations are such that, whereas the said principal has an interest in oil and gas leases issued under the Act or Acts cited in Schedule A of this bond: (1) as lessee; (2) as the approved holder of operating rights in all or part of the lands covered by such leases under operating agreements with the lessees; or (3) as designated operator or agent under such leases pending approval of an assignment or operating agreement; and

WHEREAS the principal is authorized to drill for, mine, extract, remove, and dispose of oil and gas deposits in or under the lands covered by the leases, operating agreements or designations and is obligated to comply with certain covenants and agreements set forth in such instruments; and

WHEREAS the principal and surety agree that without notice to the surety the coverage of this bond, in addition to the present holdings of the principal, shall extend to and include:

1. Any oil and gas lease hereafter issued to, or acquired by the principal in the States now named in Schedule A, or later named in a rider, the coverage to be confined to the principal's holdings under the Act or Acts cited at the head of the column in which the name of the State appears and to become effective immediately upon such issuance or upon departmental approval of a transfer in favor of the principal.

2. Any operating agreement hereafter entered into or acquired by the principal affecting oil and gas leases in the States now named in Schedule A, or later named in a rider. The coverage shall become

effective immediately upon departmental approval of the agreement or of a transfer of an operating agreement to the principal.

3. Any designation subsequent hereto of the principal as operator or agent of a lessee under a lease issued pursuant to the Act or Acts cited in Schedule A and covering lands in a State named in Schedule A, either presently or by rider. This coverage shall become effective immediately upon the filing of such a designation under a lease.

4. Any extension of a lease covered by this bond, such coverage to continue without any interruption due to the expiration of the term set forth in the lease.

Provided, that the surety may elect to have the additional coverage authorized under this paragraph become inapplicable as to all interests of the principal acquired more than thirty (30) days after the receipt of notice of such election by the Bureau of Land Management.

The surety hereby waives any right to notice of, and agrees that this bond shall remain in full force and effect notwithstanding:

1. A transfer or transfers, either in whole or in part, of any or all of the leases, or of the operating agreements, and further agrees to remain bound under this bond as to the interests either in the leases or in the operating agreements, or in both, retained by the principal when the approval of the transfer or transfers become effective.

2. Any modification of a lease or operating agreement, or obligations thereunder, whether made or effected by commitment of such lease or operating agreement to unit, cooperative, communitization or storage, agreements, or development contracts, suspensions of operations or production, waivers, suspensions or changes in rental, minimum royalty and royalties, compensatory royalty payments, or otherwise; and

WHEREAS the principal and surety hereby agree that notwithstanding the termination of any lease or leases, operating agreements or designations as operator or agent, covered by this bond, whether the termination is by operation of law or otherwise, the bond shall remain in full force and effect as to all remaining leases, operating agreements, or designations covered by the bond; and

WHEREAS the principal, as to any lease or part of a lease for lands as to which he has been designated as operator or agent, or approved as operator, in consideration of being permitted to furnish this bond in lieu of the lessees, agrees and by these presents does hereby bind himself to fulfill on behalf of each lessee all obligations of each such lease for the entire leasehold in the same manner and to the same extent as though he were the lessee; and

WHEREAS the principal and surety agree that the neglect or forbearance of said lessor in enforcing, as against the lessees of such lessor, the payment of rentals or royalties or the performance of any other covenant, condition or agreement of the leases, shall not, in any way, release the principal and surety, or either of them, from any liability under this bond; and

WHEREAS the principal and surety agree that in the event of any default under the leases, the lessor may commence and prosecute any claim, suit, action, or other proceeding against the principal and surety, or either of them, without the necessity of joining the lessees.

NOW, THEREFORE, IF said principal shall in all respects faithfully comply with all of the provisions of the leases referred to hereinbefore, then the above obligations are to be void; otherwise to remain in full force and effect.

Signed on this day of , 19 , in the presence of:

NAMES AND ADDRESSES OF WITNESSES

_____ _____ (L.S.)
(Principal)

_____ _____
(Business address)

_____ _____ (L.S.)
(Surety)

_____ _____
(Business address)

GPO 833-574

A P P E N D I X
Section - F

DRILLING MUD MATERIALS

DRILLING MUD MATERIALS

FUNCTION	MATERIALS	WHY USED
Lubricants	Certain oils, graphite powder and soaps.	To reduce down-hole friction.
Flocculants	Salt, Hydrated lime, Gypsum and Sodium Tetraphosphates.	To increase gel strength. Causes some solids to settle out.
Filtrate Reducers	Bentonite clays, Sodium carboxy-methyl cellulose (CMC) and pregelatinized starch.	Reduce filter loss. Prevent "water loss" to porous formations.
Foaming Agents	Anionic foaming chemicals.	Causes formation water to foam helping gas or air drilling to continue.
Lost Circulation	Asphalt Emulsions, Asbestos Fibers, Shredded Plastics, Mica Flakes, Nut Hulls, Cedar Fibers, Cottonseed Hulls and many other materials.	To stop mud loss to porous zones.
Shale Control Inhibitors	Gypsum, Sodium Silicate, Chrome Lignosulfates, Lime and salt.	To stop or prevent swelling of shales or clays.
Surface Active Agents	Surfactant Chemicals	To permit better mixing. Example: water and oil.
Thinners and Dispersants	Quebracho, some Polyphosphates and lignitic materials.	To prevent too high a viscosity, improve pumpability, better solids distribution in muds.
Viscosifiers	Bentonite, CMC, Attapulgite clays and Asbestos Fibers.	To increase viscosity for cuttings removal and gel strength.
Preservatives	Formaldehyde	Prevent starch mud from fermenting.

DRILLING MUD MATERIALS (Cont.)

FUNCTION	MATERIALS	WHY USED
Cement Contamination	Sodium Bicarbonate	Prevents mud destruction.
Calcium Removers	Caustic Soda, Soda Ash, Certain Polyphosphates (SAPP) and Sodium Bicarbonate.	To prevent mud destruction by Gypsum or Anhydrite.
Weight Materials	Barite, Lead Compounds, Iron Oxides and high specific gravity compounds.	To increase mud weight (pounds per gallon) to hold formation fluids in place and prevent hole caving.
Corrosion Inhibitors	Hydrated Lime, Amine Salts and Dichromate salts.	To prevent corrosion of drilling equipment and casing.
Oil Emulsion	Special Emulsifiers or Soaps.	To make oil-in-water or water-in-oil emulsions for "oil base" mud.

Sources:

American Association of Oilwell Drilling Contractors. Toolpusher's Manual, Section O, September 1970.

Gatlin, Carl. Petroleum Engineering, "Drilling and Well Completions," Chapter 6, Prentice-Hall, Inc. New York. 1960.

A P P E N D I X
Section - G

WASHINGTON STATE OIL AND GAS CONSERVATION COMMITTEE
INSTRUCTIONS FOR OIL AND GAS DRILLERS
and
GENERAL RULES AND REGULATIONS GOVERNING THE
CONSERVATION OF OIL AND GAS

STATE OF WASHINGTON

OIL AND GAS CONSERVATION COMMITTEE

INSTRUCTIONS FOR OIL AND GAS DRILLERS

1. Obtain from the State Oil and Gas Supervisor, Department of Natural Resources, Geology and Earth Resources Division, Olympia, WA, 98504, a copy of the Oil and Gas Conservation Act of Washington and the Rules and Regulations issued under the authority of this act.

2. Obtain from the State Oil and Gas Supervisor two copies of Form 1 (Notice of Intention to Drill) and two copies of a performance bond. (See Rules 8 and 10, General Rules and Regulations.)

3. Request a site inspection. A site inspection for each well that is proposed must be made to insure that surface conditions are acceptable for a well site. If drilling is proposed in an urban, near urban, or environmentally sensitive area, a letter from the commissioners of the county or the council of the city where the well is to be drilled, stating they have no objection to the drilling, shall be required.

4. Return to the Supervisor the completed bond forms and the two application forms properly filled out plus $100.00 in cash, certified check, or bank draft payable to the Treasurer, State of Washington. A proposed casing program for each well to be drilled shall be submitted with the application. Upon receipt of the bonds, the applications, if in order, will be signed by the Supervisor, and one copy of the application and the bond will be returned to the applicant.

   (Drilling cannot legally start until the bond has been submitted, the fee has been received by the Supervisor, and the application has been signed by him.)

5. The driller shall give adequate notice to the Supervisor to permit witnessing of all tests including drill stem, water shutoff and production tests; and plugging operations. (See pages 19-24, Rules 14-24.)

6. A record and log of the well, on Form No. 2, shall be presented to the Supervisor within 30 days of the completion or abandonment of the well. (See pages 13-14 and Rule 12, pages 17-18.)

7. Well records and logs of all kinds shall be filed with the Supervisor within 30 days of completion or abandonment. These will, upon request, be kept confidential by the Supervisor for at least one year. (See pages 13-14 and Rule 12, pages 17-18.)

8. The driller shall give notice to the Supervisor on Form No. 3 (duplicate copies) of intention to abandon and plug well. (See Rules 23 and 24, pages 22-24.)

9. Within 15 days after plugging the well, the driller shall file Form No. 4 with the Supervisor, giving the results of the plugging procedure. (See Rule 24(g), page 24.)

Vaughn E. Livingston, Jr.
State Oil and Gas Supervisor
Department of Natural Resources
Geology and Earth Resources Division
Olympia, WA 98504

Form 1, page 1

No. .....

(This number will be filled in by the Supervisor and should always be used in correspondence relating to this well)

State of Washington
Oil and Gas Conservation Committee

NOTICE OF INTENTION TO DRILL OR DEEPEN
(Strike out inapplicable words)

Notice must be given the Oil and Gas Supervisor and approval obtained before drilling begins. Submit this notice in duplicate, accompanied by performance bond and $100.00 permit fee which shall be in cash, certified check, or bank draft payable to the Treasurer, State of Washington. One copy of this notice will be returned following approval. No fee is required if permit is to deepen a well previously drilled under Committee permit, or if well is for subsurface information only, or if for seismic shot holes.

Each person who succeeds to the rights under this permit shall, within 10 days after the rights are acquired, notify the Supervisor in writing thereof.

NAME OF COMPANY OR OPERATOR

Name: .....

Address: .....

City: .....

DESCRIPTION OF LEASE OR PROPERTY

Name and address of fee owner: .....

Number of acres: ..... Well Name and No.: .....

Number of wells on lease: ..... Acres assigned to well: .....

LOCATION OF WELL

Field or general vicinity: ..... County: .....

Well location: .....
(Give section, township, and range, and give footage from section lines)

Nearest distance from proposed well to property or lease line: ..... feet.

Distance from proposed well to nearest completed or applied for well on same lease ..... feet.

Proposed depth to be drilled .....feet. Elevation of surface .....feet.

Draw sketch in space below or file certified lease plat. The sketch must show the location of the proposed well and show distances and direction from the well to:

(1) the nearest section lines, both north (or south) and east (or west)

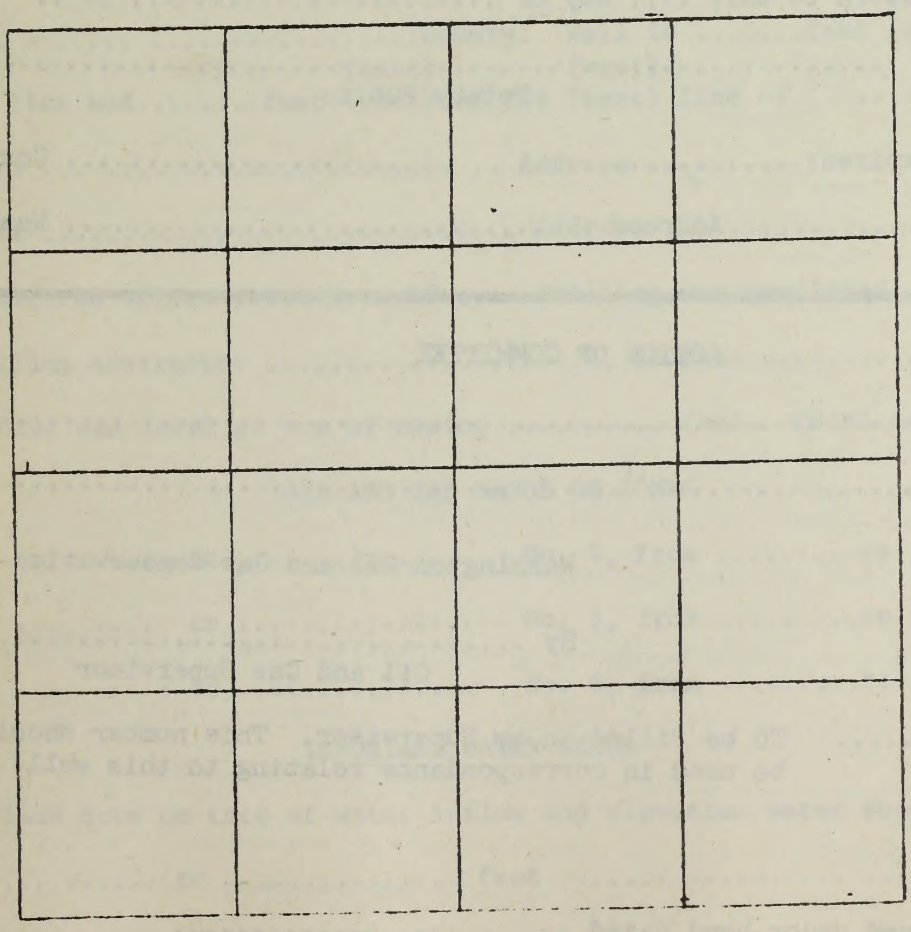
(2) the nearest lease lines on all sides of this location

(3) the nearest wells on all sides of this location.

Give names of adjoining lease or property owners and designate property lines. Indicate scale used.

Section ....., T. .....N., R. .....(E.) (W.)

North



West East

South

NOTICE OF INTENTION TO DRILL OR DEEPEN (continued)

If different from the above named company or operator, give name to which correspondence regarding this well should be addressed:

.....

AFFIDAVIT

I, ..., being first duly sworn on oath, state that to the best of my knowledge and belief the facts and matter contained on this form are true and correct.

Name .....

Title .....

Subscribed and sworn to this .... day of ....., 19 .. .

.....
Notary Public

My commission expires: .... County

Address ..... Washington

ACTION OF COMMITTEE

Approved: .....

Denied: .....

Washington Oil and Gas Conservation Committee

By .....
Oil and Gas Supervisor

Permit No. ..... To be filled in by Supervisor. This number should always be used in correspondence relating to this well.

This permit issued under bond dated .....

by ....., Principal

No. _____

(This number to be filled in by the Supervisor and should always be used in correspondence relating to this well.)

State of Washington
Oil and Gas Conservation Committee

WELL RECORD OR HISTORY

Mail to State Oil and Gas Supervisor, Department of Natural Resources, Geology and Earth Resources Division, Olympia, WA 98504, not more than thirty (30) days after completion of well. Follow instructions in Rules and Regulations of the Committee. Indicate questionable data by following it with (?).

....
Company or Operator Lease

Field or vicinity..... Well No. ..... in ..... of Sec. .....

T. ..... R. ....., ...County. Well is .....feet (south) (north) of the (north) (south) line and .....feet (west) (east) of the (east) (west) line of ..... .

The lessor is ....., Address .....

The lessee is ....., Address .....

Drilling commenced .....19... Drilling was completed ..... 19 .....

Name of drilling contractor ....., Address .....

Elevation above sea level at top of casing .....feet. Total depth .....feet

OIL AND GAS SANDS OR ZONES

No. 1, from ..... to ..... No. 4, from ..... to .....

No. 2, from ..... to ..... No. 5, from .....to .....

No. 3, from ..... to ..... No. 6, from .....to .....

IMPORTANT WATER SANDS

Include data on rate of water inflow and elevation water rose in hole.

No. 1 ..... to ..... feet .....

No. 2..... to ..... feet .....

No. 3 ..... to ..... feet .....

No. 4 ..... to ..... feet .....

CASING, LINER, AND TUBING RECORD

String	Size	Wt./Ft.	Name & Type	Amount Ft.	Amount In.	Depth Set at	Perforated From	Perforated To

CEMENT AND TESTING RECORD

Size of Hole	String	Where cement placed	No. Sacks of cement	Method Used	Pressure applied in testing	Hardness of cement used	Kind of cement

PLUGS AND ADAPTERS

.....

.....

RECORD OF SHOOTING OR CHEMICAL TREATMENT

Size	Shell Used	Explosive or Chemical used	Quantity	Date	Depth Shot or treated	Depth Cleaned out

RECORD OF DRILL-STEM AND SPECIAL TESTS

If drill-stem or other special tests or deviation or electrical surveys were made, submit report on separate sheet and attach hereto.

WELL RECORD OR HISTORY (continued)

TOOLS USED

Rotary tools were used from.....feet to.....feet, and from.....feet to.....feet.

Cable tools were used from.....feet to.....feet, and from.....feet to.....feet.

PRODUCTION

Put to producing ....., 19 .. .

The production of the first 24 hours was .....barrels of fluid of which .....% was oil; .....% emulsion; .....% water; and .....% sediment.

Gravity, °A.P.I. .....

If gas well, cu. ft. per 24 hours .....

Gallons gasoline per 1,000 cu. ft. of gas .....

Rock pressure, lbs. per sq. in. .....

EMPLOYEES

....., Driller ....., Driller

....., Driller ....., Driller

FORMATION RECORD ON OTHER SIDE

I hereby swear or affirm that the information given herewith is a complete and correct record of the well and all work done on it so far as can be determined from available records.

Subscribed and sworn to before me this ..... day of ....., 19..

.....
Notary Public

My commission expires .....

.....
Place Date

Name .....

Position .....

Representing .....
Company or Operator

Address .....

FORMATION RECORD

From	To	Thickness in feet	Formation

No._____

(This number will be filled in by the Supervisor and should always be used in correspondence relating to this well)

State of Washington
Oil and Gas Conservation Committee

NOTICE OF INTENTION TO ABANDON AND PLUG WELL

File in duplicate with the Oil and Gas Supervisor, Department of Natural Resource, Geology and Earth Resources Division, Olympia, WA 98504. One copy will be returned with approval or denial.

Field or vicinity: ..... County .....

Operator: .....Address: .....

Lease: .....Well No: .....Drilling Permit No. .....

Location:.....

Kind of well: .....Total depth: .....
Oil, gas, or dry hole

Allowable (if assigned): .....

Last production test: Oil: .....(bbls.) Water: .....(bbls.)

Gas: .....(M.C.F.)

Production horizon: .....Producing from:.....to: .....

Full details of proposed plan of plugging (including length and depth of plugs, plans for mudding, cementing, testing, and removing casing): .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Date of commencing proposed operations: .....

Name of party plugging well: .....

Address: .....

Correspondence should be sent to: .....

Name: .....

Title: .....

ACTION OF COMMITTEE

Approved: .....

Denied: .....

Washington State Oil and Gas Committee

By: .....
Oil and Gas Supervisor

Form 4

No._____

(This number will be filled in by the Supervisor and should always be used in correspondence relating to this well)

State of Washington
Oil and Gas Conservation Committee

REPORT ON RESULTS OF PLUGGING WELL

This report must be filed with the State Oil and Gas Supervisor within fifteen (15) days after plugging has been completed.

State Oil and Gas Supervisor
Department of Natural Resources
Geology and Earth Resources Division
Olympia, WA 98504

_____
Place Date

Sir:

You are hereby notified of the completion of the plugging of a well known as

.....

Well No. .... in .....of section ...., T. ...., R. ...., ...County, permission to drill which was granted on ....., 19 .., on Form 1, No. ...

Total depth of this well is ..... feet.

Date of plugging: began, ..., 19 ..; completed, ..., 19 ...

Give detailed account of the manner in which work was performed including the following: nature and quantities of materials used in plugging and the depths and lengths of the various plugs; records of any tests or measurements made; amount, size and depth of all casing left in the well; volume and gravity of mud-laden fluid used, pressures retained in mudding: .....

.....

.....

Give here a complete record of any shooting done .....

.....

Name of person in charge of plugging.....

Address .....

I hereby swear or affirm that the information given herewith is a complete and correct record of the well and all work done on it so far as cen be determined from available records.

Subscribed and sworn to before me on this .....day of ....., 19 ...

.....
Notary Public

My commission expires .....

.....
Place Date

Name .....

Position .....

Representing .....
Company or Operator

Address .....

Adopted
January 18, 1954

STATE OF WASHINGTON

DEPARTMENT OF NATURAL RESOURCES

BERT L. COLE, Commissioner of Public Lands

Oil and Gas Conservation Committee

General Rules and Regulations Governing the Conservation of Oil and Gas

Introduction

Pursuant of the power and authority delegated to the Oil and Gas Conservation Committee by the Oil and Gas Conservation Act, Chapter 146, Laws of 1951, approved March 15, 1951, after due notice the Oil and Gas Conservation Committee, hereinafter designated as the Committee, does hereby make, adopt, and promulgate the following general rules and regulations deemed by the Committee to be reasonably necessary for the proper administration and enforcement of the Act. These rules and regulations shall become effective this 18th day of January, 1954.

General

Rule 1. (a) The following rules and regulations have been adopted by the Committee as General Rules of State-wide application; these may be added to or changed, as required or deemed necessary by the Committee, in accordance with Section 11 of the Act.

(b) Special rules, regulations, and orders will be adopted when required or deemed necessary and shall prevail as against general rules, regulations, and orders if in conflict therewith.

Rule 2. (a) Notice of the adoption of new or additional rules and regulations or of the changing or amending of previously adopted rules, regulations, and orders shall be by publication in a newspaper of general circulation in the state and their effective date shall be thirty days after such publication.

(b) In the event an emergency is found to exist by the Committee, which in its judgment requires the making, changing, renewal, or extension of a rule, regulation, or order without notice, it may do so,

and such emergency rule, regulation, or order shall have the same validity as if due notice had been given. The emergency rule, regulation, or order permitted by this section shall remain in force no longer than thirty days from its effective date, and, in any event, it shall expire when a rule, regulation, or order made after due notice with respect to the subject matter of such emergency rule, regulation, or order becomes effective, or at such later date as may be provided therein.

Rule 3. Hearings before the Committee shall be open to the public. Hearings may be called by the Committee, for the purpose of taking action in respect to any matter within its jurisdiction, upon its own motion or upon the petition of any interested party. Petitions for hearings shall be written and verified and may be in the form of a letter, shall be brief and concise, and shall state in general terms the matter upon which action of the Committee is desired, the relief sought, and the reasons therefor.

Rule 4. (a) Notice of all hearings shall be given by publishing notice thereof not less than ten days before the date of the hearing in a newspaper of general circulation in the state.

(b) The Committee shall maintain a general mailing list and shall place thereon the names and addresses of all persons, firms, or corporations who make request in writing to be included on such list. Each person, firm, and corporation on such mailing list shall be mailed at the address listed a copy of all rules, regulations, notices, and orders issued by the Committee. The failure to mail a copy of these to any such person, firm or corporation shall not affect the validity of any hearing held pursuant to the notice published in accordance with the preceding paragraph or any rule, regulation, or order issued pursuant to such hearing.

(c) Notices of hearing shall state the time and place of the hearing, whether called by the Committee on its own motion or at the request of an interested party, naming the party making the request, and shall state briefly and in general terms the subject matter of the hearing and relief sought.

Rule 5. (a) Hearings shall be held in Olympia, Washington unless otherwise ordered by the Committee. After notice of hearing is once given, the hearing may be continued to another day and from day to day by order of the Committee.

(b) Upon receipt of a proper request or application for hearing, the Committee shall, if in its judgment a hearing is warranted and justifiable, promptly call a hearing, and after such hearing and with all convenient speed, and in any event within twenty (20) days after the conclusion of the hearing, shall take action with regard to the subject matter thereof.

Rule 6. The Supervisor, Division of Mines and Geology, Department of Conservation and Development, shall be exofficio the State Oil and Gas Supervisor, and shall be the designated agent of the Committee for the purpose of carrying out the provisions of the Oil and Gas Conservation Act. He shall be charged with the duty of enforcing this Act and all rules, regulations, and orders promulgated by the Committee. The Oil and Gas Supervisor, with the concurrence of the Committee, shall have the authority, and it shall be his duty, to designate a deputy or deputies and to employ all personnel necessary to carry out the provisions of this Act or of the rules, regulations, or orders of the Committee.

Rule 7. Definitions

Unless the context otherwise requires, the words defined shall have the following meaning when found in these rules and regulations, to wit:

BARREL or BARRELS OF OIL shall mean a quantity equal to 42 United States gallons of oil at a temperature of 60 degrees Fahrenheit and at atmospheric pressure, with deductions for the full percent of basic sediment, water, and other impurities present, ascertained by centrifugal or other recognized and customary test.

BLOW-OUT shall mean an uncontrolled sudden or violent escape of oil, water, gas, or drilling fluid from a well.

BLOW-OUT PREVENTER shall mean an effective casing-head control equipped with special gates or rams which can be closed around the drill pipe, or which completely closes the top of the casing when the pipe is withdrawn.

BOTTOM-HOLE PRESSURE shall mean the pressure in pounds per square inch at or near the bottom of an oil or gas well determined by a means generally recognized as satisfactory by the oil and gas industry.

CASING PRESSURE shall mean the pressure built up between the casing and tubing when the casing and tubing are packed off at the top of the well.

CASINGHEAD GAS shall mean any gas or vapor, or both gas and vapor, indigenous to an oil stratum and produced from such stratum with oil.

CHRISTMAS TREE shall mean an assembly of valves and fittings at the head of the casing of a well to control the flow. Also spoken of as "WELL-HEAD CONNECTIONS."

COMMON ACCUMULATION shall mean a geographic area, zone, or horizon definitely separated from any other such area, zone, or horizon and which contains, or from competent evidence appears to contain, a common source of supply of oil or gas or both; any oil or gas field or part thereof which comprises and includes any area which is underlaid or which from geological or other scientific data or experiments or from drilling operations or other evidence appears to be underlaid by a common pool or source of supply of oil or gas or both oil and gas.

CONDENSATE (see OIL)

CONSERVATION shall mean conserving, preserving, guarding, or protecting the oil and gas resources of the State by obtaining the maximum efficiency with minimum waste in the production, transportation, processing, refining, treating, and marketing of the unrenewable oil and gas resources of the State.

CUBIC FOOT OF GAS shall mean the volume of gas contained in one cubic foot of space at a standard pressure base and a standard temperature base. The

standard pressure base shall be 14.73 pounds per square inch absolute and the standard temperature base shall be 60 degrees Fahrenheit.

DAY shall mean a period of twenty-four (24) consecutive hours from 7:00 a.m. one day to 7:00 a.m. the following day.

DEVELOPMENT shall mean any work which actively looks toward bringing in production.

DEVELOPED AREA or DEVELOPED UNIT shall mean a drainage unit having a well completed thereon which is capable of producing oil or gas in paying quantities; however, in the event it be shown, and the Committee finds, that a part of any unit is nonproductive, then the developed part of the unit shall include only that part found to be productive.

DRAINAGE UNIT shall mean the area in a pool which may be drained efficiently and economically by one well.

FIELD shall mean the general area which is underlaid by at least one pool and shall include the underground reservoir or reservoirs containing oil or gas, or both. The words "field" and "pool" mean the same thing when only one underground reservoir is involved; however, "field", unlike "pool", may relate to two or more pools.

GAS shall mean all natural gas and other fluid or gaseous hydrocarbons not defined as oil (see below), including wet gas, dry gas, and residue gas as those terms are generally understood in the petroleum industry.

GAS ALLOWABLE shall mean the amount of natural gas authorized to be produced by order of the Committee.

GAS-OIL RATIO shall mean the relation of the gas in cubic feet to the production of oil in barrels, measured concurrently for a limited period; ie. the number of cubic feet of gas as produced, divided by the number of barrels of oil as produced.

ILLEGAL GAS shall mean gas which has been produced within the State of Washington from any well or wells in excess of the amount allowed by any rule, regulation, or order of the Committee, as distinguished

from gas produced within the State of Washington not in excess of the amount so allowed, which is LEGAL GAS.

ILLEGAL OIL shall mean oil which has been produced within the State of Washington from any well or wells in excess of the amount allowed by any rule, regulation, or order of the Committee, as distinguished from oil produced within the State of Washington not in excess of the amount so allowed, which is LEGAL OIL.

ILLEGAL PRODUCT shall mean any product of oil or gas, any part of which was processed or derived, in whole or in part, from illegal oil or illegal gas or from any product thereof, as distinguished from LEGAL PRODUCT, which is a product processed or derived to no extent from illegal oil or illegal gas.

LESSEE shall mean the lessee under an oil and gas lease, or the owner of any land or mineral rights who conducts or carries on any oil and gas development, exploration, and operation thereon, or any person so operating for himself or others.

MONTH and CALENDAR MONTH shall mean the period or interval of time from 7:00 a.m. on the first day of any month of the calendar to 7:00 a.m. on the first day of the next succeeding month of the calendar.

OIL shall mean crude petroleum oil, and any other hydrocarbons, regardless of gravity, which are produced at the well in liquid form by ordinary production methods or which are the result of condensation of gaseous hydrocarbons (condensate) before or after they leave the reservoir, other than gas produced in association with oil and commonly known as wet gas.

OIL ALLOWABLE shall mean the amount of oil authorized to be produced by order of the Committee.

OPERATOR shall mean any person who, duly authorized, is in charge of the development of a lease or the operation of a producing well.

OWNER shall mean the person who has the right to drill into and to produce from a field or pool, and to appropriate the production either to himself or for

himself and another or others.

PERSON shall mean any natural person, corporation, association, partnership, receiver, trustee, executor, administrator, guardian, fiduciary, or representative of any kind.

POOL shall mean an underground reservoir proven to contain a common accumulation of oil or gas, or both. Each zone of a general structure (or field) which is completely separated from any other zone in the structure is covered by the term "pool" as here used.

PRESSURE MAINTENANCE shall mean, 1) the reintroduction of gas or liquid produced from an oil or gas reservoir to maintain the pressure of the reservoir; 2) the introduction of gas or fluid for the same purpose but obtained from an outside source.

PRODUCER shall mean the owner of a well or wells capable of producing oil or gas, or both.

PRODUCT shall mean any commodity made from oil or gas, and shall include refined crude oil, crude tops, topped crude, processed crude petroleum, residue from crude petroleum, cracking stock, uncracked fuel oil, fuel oil, treated crude oil, residuum, gas oil, casinghead gasoline, natural gas gasoline, naphtha, distillate, propane, butane, gasoline, kerosene, benzine, wash oil, waste oil, blended gasoline, lubricating oil, blends or mixtures of oil with one or more liquid products or byproducts derived from oil or gas, and blends or mixtures of two or more liquid products or byproducts derived from oil or gas, whether hereinabove enumerated or not.

PURCHASER shall mean any person who acquires title to oil or gas by purchase from a producer or other person.

REASONABLE MARKET DEMAND, as to oil, means the amount of oil reasonably needed for current consumption and use, together with a reasonable amount of oil for storage and working stock; and as to gas, the term means the amount of gas of any type reasonably needed to supply the current consumption and use of such type of gas.

SEPARATOR shall mean an apparatus for separating oil, gas, water, etc., as its is produced.

SHUT IN PRESSURE shall mean the maximum pressure noted at the well head a reasonable time after the well is completely shut in.

STATE shall mean the State of Washington.

SUPERVISOR shall mean State Oil and Gas Supervisor.

TENDER shall mean a permit or certificate of clearance, approved and issued or registered under the authority of the Committee, for the transportation of oil, gas, or products.

TRANSPORTER shall mean and include any person engaged in the transportation of oil or gas.

WASTE in addition to its ordinary meaning, shall mean "physical waste" as that term is generally understood in the petroleum industry, and shall include:

(a) The inefficient, excessive, or improper use of, or unnecessary dissipation of, reservoir energy; and the locating, spacing, drilling, equipping, operating, or producing of any oil or gas well in a manner which results, or tends to result, in reducing the quantity of oil or gas to be recovered from any pool in this state under operations conducted in accordance with good oil field engineering practices;

(b) The inefficient above ground storage of oil; and the locating, spacing, drilling, equiping, operating, or producing of any oil or gas well in a manner causing, or tending to cause, unnecessary or excessive surface loss or destruction of oil or gas;

(c) Producing oil or gas in such a manner as to cause unnecessary water channeling or coning;

(d) The operation of an oil well with an inefficient gas-oil ratio;

(e) The drowning with water of any pool or part thereof capable of producing oil or gas, except insofar as, and to the extent, authorized by the Committee hereunder;

(f) Underground waste;

(g) The creation of unnecessary fire hazards;

(h) The escape into the open air, from a well producing oil or gas, of gas in excess of the amount which is reasonably necessary in the efficient development or production of the well;

(i) The use of gas for the manufacture of carbon black, except as provided in Section 16 of Chapter 146, Laws of 1951.

(j) Production of oil and gas in excess of the reasonable market demand.

WELL HISTORY or WELL RECORD shall mean the chronological written record of all operations, including formation tests, water shut-off tests, description of water, oil, or gas encountered in drilling a well with such additional information as to gas volumes, pressures, rate of fill-up, water depths, caving strata, casing record, etc., as is usually recorded in the normal procedure of drilling.

WELL LOG shall mean the systematic detailed record and descriptions of lithology and of strata and formations encountered in drilling a well, and shall include all electric, radioactivity, and other logs, if run.

Drilling--Production

Rule 8. Application to Drill (Form__1__)

(a) A person desiring to drill a well in search of oil or gas shall notify the Supervisor of such intent on Form __1__, and shall pay a fee of one hundred dollars ($100.00) for a permit to drill each such well. The fee shall accompany the application and be in cash, certified check, or bank draft, payable to State Treasurer, State of Washington. Upon receipt of notification and the fee, the Supervisor will promptly issue to such person a permit to drill, unless the drilling of the well is contrary to law, or to a rule, regulation, or order of the Committee. The drilling of the well is prohibited until a permit to drill is obtained in accordance with the provisions of this section. If the permit is disallowed,

the Supervisor will immediately notify the person in writing the reasons therefor. The permit will be on such form as the Committee may prescribe.

(b) An operator shall be required to obtain a permit to deepen when the well is to be recompleted in another pool, but no fee is required for the permit to deepen a well previously drilled under Committee permit. No permit is required for workover so long as the well remains completed in the same pool, provided the casing above the freshwater shut-off depth is not to be disturbed or altered by the redrilling, conditioning, or testing to be performed.

(c) A permit, for which no fee is required, shall be obtained for a relatively shallow well or wells (less than 2,000 feet) not drilled in search of oil and gas but solely to obtain subsurface geological data.

(d) A blanket permit, for which no fee is required, shall be obtained for the shot holes necessary to conduct a seismic geophysical investigation of structure and stratigraphy. The application for such blanket permit shall contain information on the general location of the investigative work, the approximate number and depth of shot holes, and such other information as the Supervisor may require.

Rule 9. Transfer of Drilling Permit

Each person who succeeds to the rights under a drilling permit shall, within ten (10) days after the rights are acquired, notify the Supervisor in writing thereof.

Rule 10. Bond to be Furnished

The Committee, except as hereinafter provided, shall require from the owner a good and sufficient bond in the sum of $5,000.00 for each well whose estimated depth is thirty-five hundred feet or less (3,500), in the sum of $7,500.00 for each well whose estimated depth is thirty-five hundred (3,500) to seven thousand feet (7,000); and in the sum of $10,000.00 for each well whose estimateddepth is over seven thousand feet (7,000), payable to the State of Washington, condition for performance of the duty to properly plug each dry or abandoned well in accordance with the rules and regulations of the Committee. Said bond shall remain

in force and effect until the plugging of said well is approved by the Supervisor. It is provided, however, that any owner in lieu of such bond may file with the Supervisor a good and sufficient blanket bond in the principal sum of not less than $10,000.00 covering all wells drilling or to be drilled whose estimated or actual depth is thirty-five hundred (3,500) feet or less, or in the principal sum of not less than $25,000.00 if the estimated or actual depth of any one of the wells drilling or to be drilled is more than thirty-five hundred and one (3,501) feet or more, and upon acceptance and approval by the Supervisor of such blanket bond said bond shall be considered as compliance with the foregoing provisions requiring an individual well bond.

The Supervisor shall not consent to the termination and cancellation of any bond until the well or wells for which it has been issued have been properly abandoned. A well is properly abandoned when drilling, redrilling, or deepening has ceased before completion to production of oil or gas, and the person drilling, redrilling, or deepening it has shown to the satisfaction of the Supervisor that all proper steps have been taken to shut off and exclude all water from oil-bearing or gas-bearing strata encountered in the well, and to protect underground or surface water suitable for irrigation or farm or domestic purposes from the infiltration or addition of any detrimental substance.

Rule 11. Identification of Well

Every person drilling for oil or gas or operating, owning, controlling, or in possession of any well drilled for oil or gas, shall post on the derrick or in a conspicuous place near the well, a sign in reasonably large and clear lettering, showing the name of the person drilling, operating, owning, or controlling the well; the name of the lease; the number of the well; the permit number; and the legal land description of the location by county, section, township, and range.

Rule 12. Well History or Record and Well Log (Form 2)

(a) During the drilling of any well, except seismic, that penetrates into the bedrock below the unconsolidated surficial cover, the owner, operator, contractor, driller, or other person responsible for the conduct

of the drilling operations shall keep at the well, or at his headquarters in the state, or otherwise conveniently available to the Supervisor, a detailed and accurate record of the drilling operations and a log of the strata drilled, reduced to writing from day to day, which shall be accessible to the Committee and its agents at all reasonable times. A copy of the well history or record and a copy of the well log shall be furnished to the Supervisor upon Form 2, prescribed by the Committee, within thirty (30) days after the completion or abandonment of the well. The well history or record shall describe the progress of drilling, the water, oil, or gas encountered, and such additional information as to gas volumes, pressures, rate of fill-up, water depths, caving strata, casing record, shooting, perforating, chemical treatment, description and results of water-shut-off tests, casing tests, drill-pipe packer tests, and other tests, as are usually recorded in the normal procedure of drilling. The well log shall progressively describe the strata and formations encountered. Any electrical or radioactivity logging or surveying of the well shall also be recorded and a copy furnished the Supervisor within six (6) months after completion.

(b) All well histories, and records, well logs, results of directional surveys, and other reports submitted under this rule shall be kept confidential by the Committee for a period of one year if the well is a "wildcat" or "exploratory well" and if the operator so requests. (See Chapter 146, Laws of 1951, Section 28.)

Rule 13. Deviation Tests

All wells must be drilled with due diligence to maintain a reasonably vertical well bore unless special circumstances require the bore to deviate from the vertical, in which instance permission to so deviate shall be obtained from the Supervisor. The Committee shall have the right to make or to require the operator to make a directional survey of the hole, at the request of an off-set operator and at the expense of said off-set operator prior to the completion of the well; and the Committee shall have the right to make or to require the operator to make a directional survey of the hole at any time, and at the expense of

the operator, in order to ascertain that the well has not deviated beyond the boundaries of property on which well is located.

Rule 14. Sealing off Strata

(a) All fresh waters of present or probable future value for domestic, municipal, commercial, stock, or agricultural purposes shall be confined to their respective strata and shall be adequately protected.

(b) All oil, gas, and water strata above and below the producing horizon shall be sealed or separated in order to prevent their contents from passing into another stratum.

Rule 15. Casing Requirements

All oil wells shall be completed with a string of casing which shall be properly cemented at a sufficient depth adequately to protect the oil-bearing stratum. Gas-producing wells shall be cased in a similar manner. Cement shall be allowed to stand at least a total of 24 hours before drilling the plug; provided, that a lesser period, but not under 16 hours, may be permitted by the Supervisor when he is satisfied that such lesser period is adequate.

Rule 16. Blow-out Prevention

In drilling in unproven areas or where high pressures are likely to exist, all proper and necessary precautions shall be taken for keeping the well under control, including the use of blow-out preventers and high-pressure fittings attached to properly anchored and cemented casing strings. The Supervisor shall have the authority to require the operator to test surface casing and blow-out prevention equipment to determine that it be adequate and proper for preventing blow outs.

Rule 17. Fire Hazards

(a) Any rubbish or debris that might constitute a fire hazard in the operation of the well, tanks, separator, or other equipment shall be removed to a distance of at least one hundred (100) feet from the well location, tanks, and separators.

(b) Oil shall not be stored in unlined earthen reservoirs or in open receptacles after a reasonable period allowed for completion and unless approved by the Supervisor.

Rule 18. Well-head Fittings

Christmas-tree fittings or well-head connections shall have a working pressure in keeping with the expected pressure of the well.

Rule 19. Tubing

Each flowing well shall be produced through tubing and shall be equipped with a master valve; however, a dual completion is permissible whereby one zone is produced through tubing and another through casing.

Rule 20. Separators

When good operating practice so requires, all flowing wells must be produced through suitable oil and gas separators or treaters.

Rule 21. Chokes

Each flowing well shall be equipped with an adequate choke or bean to control properly the flowing thereof.

Rule 22. Agents to Have Access to All Wells and Well Records, to Witness or Make Well Tests, and to Measure Production from Wells

All operators of oil and gas wells are required to permit the agents of the Committee to witness all tests, and to permit and assist the agents of the Committee to make any and all tests, including bottom-hole pressure and gas-oil determinations, that may be required by the Committee on any and all wells. The agents of the Committee shall have access to all well records, and shall be permitted to come upon any lease or property to inspect any and all wells and to gauge the production therefrom at all times.

Rule 23. Notice of Intention to Abandon and Plug

The owner or operator shall not permit any well drilled for oil, gas, salt-water disposal, or any other purpose

in connection with the exploration or production of oil and gas, to remain unplugged, except as otherwise provided in Rule 26, after such well is no longer to be used for the purpose for which it was drilled or converted.

Before any work is commenced to abandon any well drilled for the discovery of oil or gas, including any well drilled below the fresh-water level, except such holes as are described in Rule 25, the owner or operator thereof shall, prior to beginning operations of plugging the well, give notice to the Supervisor or his representative of his intention to abandon such well. Such notice shall be written, on Form 3, except that it shall be permissible to give oral notice followed within 24 hours by written confirmation on Form 3. Upon receipt of such notice, the Supervisor may send a duly authorized representative to the location specified, to be present at the time indicated in such notice, to witness the plugging of the well.

Rule 24. Procedure for Plugging

Each abandoned well drilled for the discovery of oil or gas shall be plugged by or on behalf of the owner, operator, or producer who is in charge of the well and responsible therefor. Unless a different method and procedure shall be approved by the Supervisor upon application by the owner, operator, or producer on Form 3, the method and procedure for plugging the well shall be as follows:

(a) The bottom of a cased hole shall be filled to, or a bridge shall be placed at, the top of each producing formation open through perforations to the well bore, and in either event a cement plug not less than fifteen (15) feet in length shall be placed, whenever possible, immediately above each producing formation open to the well bore.

(b) A cement plug not less than fifteen (15) feet in length shall be placed at approximately fifty (50) feet below all fresh-water-bearing strata.

(c) A cement plug shall be placed at or near the surface of the ground in each hole in such manner as not to interfere with soil cultivation.

(d) The interval between plugs shall be filled with approved heavy mud-laden fluid.

(e) A steel plate shall be welded to the top of the surface string of casing.

(f) An uncased hole shall be plugged between fresh- and salt-water zones. It may be filled with approved heavy mud up to the base of the surface string, if this reaches below the fresh-water zone, and in the lower part of this surface string a plug of not less than fifteen (15) feet of cement shall be placed. A steel plate shall be welded to the top of the surface string of casing.

(g) Within fifteen (15) days after plugging of any well, the owner, operator, or producer responsible therefor who plugged or caused to be plugged the well shall file with the Supervisor an affidavit on Form 4 setting forth in detail the method used in plugging the well.

Rule 25. Seismic, Core, and Other Exploratory Holes to be Plugged

Before any hole is abandoned which is drilled for seismic, core, or other exploratory purposes and which penetrates below the fresh-water zone, it shall be the duty of the owner or driller of any such hole to plug same in such a manner as to properly protect all fresh-water-bearing formations. No such hole shall be left in such a condition as to form a hazard to persons or livestock.

Rule 26. Wells Used for Fresh Water

When the well to be plugged may safely be used as a fresh-water well and such utilization is desired by the landowner, the well need not be filled above the required sealing plug set below fresh water; provided, that written authority for such is obtained from the landowner and filed with the Supervisor. Approval by the Supervisor of the work done shall relieve the operator of further responsibility under the Oil and Gas Conservation Act.

A P P E N D I X
Section - H

1. List of persons, groups, businesses, local, state and Federal government agencies to whom we mailed, on October 16, 1975, a request for input into our oil and gas E.A.R. The list is arranged in a general alphabetical order, a copy of the mailing follows the list.

2. Letter mailed in late December 1975 to individuals having surface ownership where the U.S. retained the mineral rights.

3. Copy of the news items run by the Tri-City Herald of Pasco, WA and the Yakima Herald-Republic of Yakima, WA.

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3100 (102.4)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Spokane District Office
Room 551, U. S. Court House
Spokane, Washington 99201

October 16, 1975

Dear Sir:

The Spokane District of the Bureau of Land Management is preparing an environmental analysis report on the impact that oil and gas leasing may have on the south central Washington area as shown on the attached map.

BLM has received 119 applications to lease approximately 170,000 acres of both public and private lands in Yakima, Kittitas, Grant and Benton Counties. The surface acreages consist of an intermingled ownership of about 31 percent private, 5 percent state and 64 percent federal lands. In addition to the 119 leases, the five companies involved will be making separate arrangements with the private owners who control the mineral rights on their lands. This could double the actual acreage affected by oil and gas leases.

The purpose of BLM's environmental impact evaluation will be to provide an over view of the proposed action as it will affect the lands administered by federal agencies. The attached "environmental analysis worksheet" lists specific environmental aspects that need to be considered in the report. If the oil and gas leases are approved, the U. S. Geological Survey will be responsible for writing individual environmental analysis reports on each lease prior to actual work on the ground.

We solicit your comments on the possible effects of the issuance of oil and gas leases preparatory to exploration and development of the petroleum resources of south central Washington. To be considered for inclusion in the final report your comments should reach this office no later than November 30, 1975.

Thank you for your assistance in this matter.

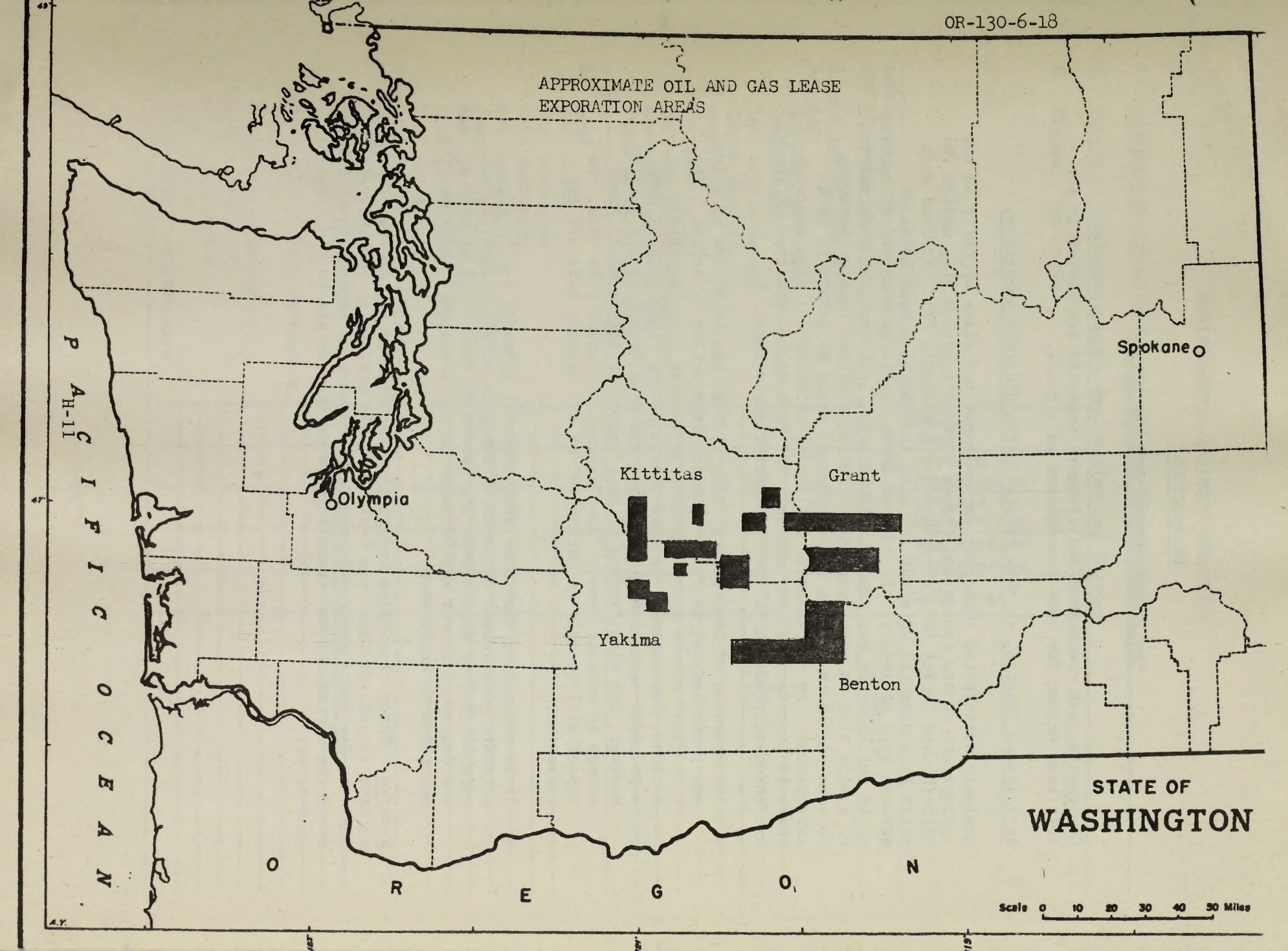
Sincerely yours,

R. L. Schaertl

Richard L. Schaertl
District Manager

Enclosures
1. Map
2. E.A.R. Worksheet

OR-130-6-18


APPROXIMATE OIL AND GAS LEASE
EXPORATION AREAS
Spokane
Olympia
Kittitas
Grant
Yakima
Benton
P A C I F I C O C E A N
O R E G O N
STATE OF
WASHINGTON
Scale 0 10 20 30 40 50 Miles

INSTRUCTIONS

ENVIRONMENTAL ANALYSIS CHECKLIST

1. Components, sub components and elements impacted are listed in the left hand column for your convenience as a guide.

2. Anticipated Impacts, as they relate to the discrete operation.

   Evaluate anticipated impact on each element and place an entry in the appropriate square indicating degree of impact as low (L), medium (M), high (H), no impact (0), or unknown or negligable (X). Proceed each entry by a plus (+) or minus (-) sign indicating a beneficial or adverse type of impact. If type of impact reflects a matter of opinion or is not known,do not proceed with a sign. For example, construction of a wind mill on open range has a definite visual impact; however, to some people the effect is detrimental while to others it is an improvement. By not entering a plus (+) or minus (-) sign the worksheet is kept factual and unbiased. If both degree and type of impact are unknown, place an (x) in the appropriate square.

   a. The measures of impact (e.g. low, medium, and high) are relative and their meaning may vary slightly from action to action. The term "low" should not be applied to impacts of a negligible nature. For example, we know that a pickup truck driving down a proposed fence line laying wire has some impact on air quality. However, the significance of this impact is not normally great enough to warrant even a "low" rating. In cases like this, the impact will usually be marked "0" or the element left off the worksheet.

   b. It is recognized that some environmental elements may defy accurate measurement or in-depth analysis within current Bureau capabilities or expertise. The nature of the action as well as type and degree of impact should guide in the decision to seek outside expertise or assistance.

3. Remarks - Enter clarifying information relative to any of the components we have listed, or those you feel we should address in the analysis report. Use extra sheets of paper as necessary to express your thoughts about the components and their impacts as they relate to the discrete operations.

ENVIRONMENTAL ANALYSIS CHECKLIST

1. Action - Exploration for Oil and Gas Resources

2. Stages of Implementation - Exploration and Testing

3. Discrete Operation

Components, sub components and elements impacted	Anticipated Impacts						Remarks
	Access Road	Airborn Exploration	Surface Exploration	Sub surface Exploration	Drilling		
I NON LIVING COMPONENTS							
A. Air							
Movement patterns							
Temperature							
Particulate matter							
Carbon monoxide							
Hydrocarbons							
Nitrogen oxides							
Radiological contaminants							
Non-ionizing radiation							
Photo chemical oxidants							
B. Land							
Soil depth							
Soil structure							
Soil nutrients							
Soil erosion							
Chemical soil pollution							
Geologic structures							
Land use compatibility							
Land use suitability							
C. Water							
Hydrologic cycle							
Sediment load							
Dissolved solids							
Chemicals & toxic substances							
Nutrients							
Coliform contamination							
Acid balance (ph)							
Dissolved oxygen							
Temperature							
Radiological contaminants							

3. Discrete Operation	Access Road	Airborn Exploration	Surface Exploration	Sub Surface Exploration	Drilling	
Components, subcomponents and elements impacted	Anticipated Impacts					Remarks
II LIVING COMPONENTS						
A. Plants (acquatic)						
Vascular						
Phytoplankton						
Floating						
B. Plants (terrestrial)						
Lichens and mosses						
Grasses						
Forbes						
Shrubs						
Conifers						
Broadleaf trees						
C. Animals (acquatic)						
Mammals						
Birds						
Amphibians and reptiles						
Invertebrates						
Zooplankton						
D. Animals (terrestrial)						
Mammals						
Birds						
Reptiles						
Invertebrates (insects)						
Man						
III ECOLOGICAL INTERRELATIONSHIPS						
A. Ecological Processes (plant)						
Succession						
Food relationships						
Community relationships						
Energy transfer						
Hazard to human & animal health and safety						
IV HUMAN VALUES						
A. Landscape Character						
Harmonious						
Accentuating						
Visual						
Sound						
Odor						

3. Discrete Operation	Access Road	Airborne Exploration	Surface Exploration	Sub Surface Exploration	Drilling	
Components, subcomponents and elements impacted	Anticipated Impacts					Remarks
IV HUMAN VALUES						
B. Sociocultural Interests						
1. Education-Scientific						
Geological						
Ecological						
Archeological						
2. Historical						
Persons						
Events						
Cultures						
Architecture and style						
Western frontier						
3. Cultural						
Indian						
Religious						
Other ethnic groups						
4. Other Human Interests						
Uniqueness						
Remoteness						
Fragility						
5. Suburban-Urban						
Life style						
Transportation						
Industry						
Regulatory agencies						
6. Social Welfare						
Jobs						
Goods and Services						
Attitudes						

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Spokane District Office
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The President's directive to pursue an active energy resources development program has led to exploration for possible oil and gas deposits here in the state of Washington. The main exploration efforts to date center in South Central Washington.

Currently five oil companies and their representatives have applied for federal oil and gas leases in Washington. The applicants have already obtained some leases from private landowners and from the state. More than 120 applications have been filed with the Bureau of Land Management (BLM) involving approximately 170,000 acres. A large proportion include private lands in which the United States retained the oil and gas rights in the patent. It is our belief that many are "protective" type applications and drilling on these is a remote possibility.

There are several actions necessary prior to issuing a lease, such as:

1. The BLM prepares an environmental analysis report concerning the overall effect of exploration, drilling, production, and abandonment procedures on federal lands, and on those private lands in which the United States retained the mineral rights. If the decision is to lease, the lease will be issued for a ten year period, renewable if oil or gas is produced in paying quantities.

2. If the lessee desires to drill he applies to the U.S. Geological Survey (USGS) for a permit. An on-site inspection by representatives of the USGS, BLM, lessee, or operator and contractors is made. The purpose is to select the most feasible and environmentally acceptable well site, access roads, and other proposed surface use areas.

3. The USGS then prepares an on-site environmental analysis report for the operation before drilling is allowed to commence. Permits will contain stipulations for rehabilitation of drill sites. Such stipulations, or a modification thereof, are made a part of the contract with the lessee or operator.

4. The USGS supervises the drilling and the clean up after completion of operations. The lessee or operator is required to provide and maintain a bond for protection of the surface of the leased lands, whether federally or privately owned.

Lease application, serialized OR (Wash), includes the following lands, of which you appear to own the surface:

Willamette Meridian, Washington

T. , R. , Section

The mere fact that there is an application to lease these lands for oil and gas does not necessarily mean that there will be actual drilling. Deep drilling of the type required to explore for oil and gas is extremely expensive. Historically this has not lead to extensive drilling unless surface exploration indicates a potential for discovery or an actual discovery is made.

If you have questions about this program please contact this office.

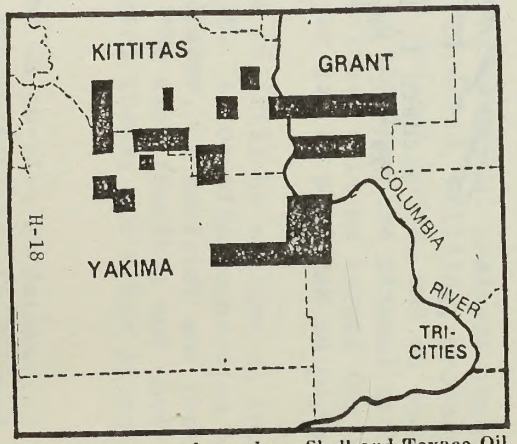
Sincerely yours,

R. L. Schaertl

Richard L. Schaertl
District Manager

TRI-CITY HERALD, PASCO, KENNEWICK, RICHLAND, WASHINGTON Sunday, October 26, 197

Mid-Columbia oil probe opinions sought



The dark areas show where Shell and Texaco Oil companies and others are seeking to explore for oil and gas.

Some 200 clubs and organizations have been asked to give their opinions on petroleum exploration requests from two oil companies.

The Bureau of Land Management (BLM) has received 119 applications including several from Shell and Texaco oil companies to lease 170,000 acres of public land for oil and gas exploration.

The leases are in Yakima, Kittitas, Grant, and Benton counties and include areas in the Saddle Mountains, Rattlesnake Hills and Wahluke Slope, 35 miles northwest of Richland.

The BLM is soliciting comments from the public for input to an environmental report dealing with ecological, cultural, social and economic aspects of exploration.

The Spokane BLM office has mailed an environmental questionnaire to about 200 organizations including conservation groups, soil districts, and cattlemen and wants to hear from individual citizens as well.

Those wishing to have their views considered should contact the Spokane BLM office in the U.S. Courthouse, West 920 Riverside St., Spokane. Written comments should reach the BLM office by Nov. 30.

The Shell Oil Co. has leased 123,880 acres of private land to resume gas exploration which was abandoned 18 years ago. They also have filed for leases on 118,850 acres of federal land.

A Shell spokesman in San Mateo, Calif., said in August the first phase of seismic testing in search of oil deposits already has been completed and is being analyzed in Houston.

In 1957 Shell participated with Richfield Oil Co. and Standard Oil in drilling a well on the Henry Anderson Ranch on Rattlesnake Mountain 20 miles north of Prosser.

Drilling ended after 10,500 feet and $625,000 spent with nothing but solid basalt found.

The Shell spokesman said there is renewed interest because of drilling improvements and the high price oil making marginal ar more favorable.

P-1121-1
July 1964
(Formerly A1-14)

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF LAND MANAGEMENT

PUBLICITY RECORD

Newspaper and Location Yakima Herald-Republic

Date of Publication Oct.29, 1975

Submitting Office Spokane District

Yakima Herald-Republic Wednesday, October 29, 1975—3

Oil explorations

By ROB TUCKER

Two oil companies and three individuals have indicated plans to search 340,000 acres of ground in South Central Washington if they can procure leases granting them mineral rights in four counties.

According to Albert Martin, chief of the division of resources at the Bureau of Land Management's Spokane office, Shell Oil Company and Texaco are two of five parties which have asked the BLM for leases to 170,000 acres of public lands in Yakima, Kittitas, Grant and Benton counties. Martin said parties may be negotiating with private landowners for leases involving another 170,000. acres of land.

Martin said Tuesday the three other parties applying for leases can only be identified by the names Yates, Puckett and Holcomb.

"We don't know whether they are private individuals or representatives of a company," he said.

BLM District Manager Richard L. Schaertl said in a prepared statement that the two companies are "making separate arrangements with the private owners who control the mineral rights on their lands. This could double the actual acreage

eyed in Yakima Valley

affected by oil and gas leases," he explained.

Martin said some of the requests for leases involve lands adjacent to ground presently being explored by Shell Oil Company in Kittitas and Yakima counties.

The two major companies and the three other agents have filed 119 separate lease applications for various tracts of ground, including some private property to which the federal government holds mineral rights, Schaertl said.

In order to determine the impact of operations planned by the companies, the BLM is soliciting comments from the public for consideration in an environmental report being prepared on the leasing of land in South Central Washington for oil and gas exploration, he added.

BLM officials have contacted over 200 public and private agencies for their input and request that all comments be sent to the Spokane District Office before Nov. 30, 1975, Schaertl said.

The surface acreages under consideration which involve the federal government consist of an intermingled ownership of about 31 per cent private, five per cent state and 64 per cent federal lands, he said.

According to BLM officials, the lands include ground in the Manastash Ridge-Cleman Mountain country along the Yakima-Kittitas county line; an area lying near Cowiche Creek drainage west of Yakima; lands in the Rattlesnake Hills which lie in northeast Yakima and Benton counties; ground south of Ellensburg in northwest lower Kittitas County; land in the Umptanum and Squaw Creek drainages between Yakima and Brushy Creek in eastern Kittitas County; ground south of George extending to the Potholes Reservoir in Grant County; and ground within the Lower Crab Creek corridor, extending from the mouth of the creek east to Othello.

INTERIOR - PORT. AND OREGON

A P P E N D I X
Section - I

USGS LETTER
SECRETARIAL ORDER 2948

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logical Survey
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Conservation Division
Western Region
Menlo Park, Calif.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Conservation Division
Area Geologist's Office
345 Middlefield Road •
Menlo Park, California 94025

March 25, 1976

Memorandum

Subject: Leasable mineral report to accompany comments on BLM's EAR for oil and gas leasing in Washington

All of the lease applications listed on the attached sheets are for lands classified valuable prospectively for oil and gas, except for the following areas, which are outside those lands:

OR 13587, T. 18 N., R. 15 E., Secs. 28 and 30
OR 13588, T. 18 N., R. 15 E., Sec. 20
OR 13589, T. 18 N., R. 15 E., Sec. 19
OR 13591, T. 18 N., R. 15 E., Sec. 17 and 18
OR 13592, T. 18 N., R. 14 E., Secs. 24, 25, 26

The following lands are classified valuable prospectively for oil and gas, and coal, also:

OR 13587, T. 18 N., R. 15 E., Sec. 26
OR 13588, T. 18 N., R. 15 E., Secs. 14, 22, 24
OR 13589, T. 18 N., R. 15 E., Sec. 5
OR 13590, T. 18 N., R. 15 E., Secs. 10, 12, 13
OR 13591, T. 18 N., R. 15 E., Secs. 8, 16

The following lands are classified valuable prospectively for coal but not oil and gas:

OR 13591, T. 18 N., R. 15 E., Secs. 17, 18
OR 13592, T. 18 N., R. 14 E., Secs. 24, 25, 26

The following lands are classified valuable prospectively for oil and gas, and geothermal resources, also:

OR 13797, T. 12 N., R. 15 E., Sec. 12

Based on available information, no other leasable minerals are believed to be present in the applied-for lands.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

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October 6, 1972

ORDER NO. 2948

Subject: Division of Responsibility Between the Bureau of Land Management and the Geological Survey for Administration of the Mineral Leasing Laws - Onshore

Sec. 1. Purpose. The purpose of this Order is to set forth the administrative and management procedures for Departmental onshore mineral leasing and operating activities. The spirit and intent of this Order flow from the Department's mineral management objectives of: orderly and timely resources development, protection of the environment, and receipt of fair market value for leased mineral resources.

Sec. 1(a) Orderly and Timely Resource Development includes the Department's responsibilities to:

(1) Foster, promote, and encourage the exploration for and the production of the mineral deposits from the leasable lands; promote competition;

(2) Encourage the active development of the mineral deposits in the leasable lands in a manner compatible with the use of the same lands for other purposes; assure that mineral developers receive the acreage necessary for economic plant investment, development, and production;

(3) Encourage the maximum ultimate recovery of the mineral deposit; prevent waste; promote the conservation of the mineral resources;

(4) Assure adequate minimum production and diligent development requirements for mineral deposits.

(b) Protection of the Environment includes the Department's responsibilities to:

(1) Assure that mineral exploration and production be conducted with the maximum protection of the environment;

(2) Assure the rehabilitation of disturbed lands;

(3) Assure that precautions are taken to protect public health and safety; and

(4) Assure full compliance with the spirit and objectives of the National Environmental Policy Act of 1969, other Federal environmental legislation, and supporting Executive Orders and regulations.

(c) Receipt of Fair Market Value for Leased Mineral Resources includes the Department's responsibilities to assure the public a fair market value return for the use of public lands and the disposition of its mineral resources.

Sec. 2. Agency Responsibilities. The BLM exercises at the Bureau level the Secretary's discretionary authority to determine whether or not leases, permits, and licenses are to be issued. The Bureau of Land Management is responsible for issuing mineral leases, permits, and licenses, and is the office of record in mineral leasing matters. The Geological Survey is responsible for all geologic, engineering, and economic value determinations for the Department's mineral management program. These determinations include: the mineral characteristics of lease and permit areas; parcelling; amounts of bonds; royalties; unit values; rentals; mineral resource evaluations; reserves; investment, diligent development, and minimum production requirements; and all other terms and conditions relating to mineral operations under leases and permits. Geological Survey exercises the Secretary's delegated authority regarding operations conducted within the area of operation by permittees, lessees, and licensees and determines the actions to be taken by them from the standpoint of the development, conservation, and management of mineral resources under the jurisdiction of the Department. GS will refer to BLM any instances of noncompliance with lease terms requiring cancellation action, and BLM will inititate the necessary action.

For the purpose of this Order, the area of operation is defined as that area of the present and planned mine, oil and gas field, or geothermal resource field exploratory, development, and production operations, as presented in an approved exploration or mining plan, drilling permit, oil, gas, or geothermal field development plan, or plan for the abandonment of wells or operations. The area of operation may cover a fraction of a lease or permit area, or it may cover several lease or permit areas. It encompasses the general area needed for storage piles, spoils piles, tailings ponds, on-project mill sites, flow lines, separators, surge tanks, storage tanks, on-project truck or rail-loading stations, drill pads, mud pits, workshops, compressors, generators, on-project power plants, and other such facilities used for on-project mine, oil and gas field, or geothermal resource field exploratory, development, and production operations.

(a) Environmental Protection. The Bureau of Land Management, in cooperation with the Geological Survey, formulates the general requirements to be incorporated in leases, permits, and licenses for the protection of the surface and non-mineral resources and for reclamation. The Geological Survey, before approving exploration and mining plans, drilling permits, oil, gas, or geothermal field development plans, or plans for the abandonment of wells or operations, consults with the Bureau of Land Management on the adequacy of the surface use, environmental protection, and reclamation aspects of the plans and will not grant approval if inconsistent with the BLM's recommendations without further discussions with BLM. If differences remain after these further discussions, the resolution is made by the Assistant Secretary--Mineral Resources and the Assistant Secretary--Public Land Management. If required, the Under Secretary resolves any remaining differences. The BLM is responsible for compliance examinations of environmental protection requirements outside the operating area and for reporting infractions to the GS for discussions with, or orders to, the permittee, lessee, or licensee. GS examines operations to ensure compliance with environmental protection and rehabilitation requirements inside the operating area. With respect to approval of access roads, pipelines, utility routes and other surface uses outside the operating area, the Bureau of Land Management has the primary responsibility but obtains the recommendations of the Geological Survey before taking final action. Orders to operators for any remedial action is the responsibility of the Geological Survey.

(b) Expertise. The Geological Survey is responsible for maintaining engineering, geologic, geophysical, economic, and other technical expertise needed by the Department to assure compliance with applicable laws, operating regulations, and the objectives of the Department's mineral management program. The Bureau of Land Management is responsible for maintaining expertise needed by the Department for action on applications filed with BLM under the mineral leasing laws to assure compliance with applicable laws, leasing regulations, and the objectives of the Department's mineral management program.

(c) Contacts with Applicants.

(1) Prior to the issuance of mineral leases, permits, and licenses, the Bureau of Land Management will represent the Secretary in dealing with applicants.

(2) After issuance and during the exploration, development, and production phases of leases, permits, and licenses, and until a lease, permit, or license has terminated (at which time management is the sole responsibility of BLM) the Geological Survey is the sole representative of the Secretary in all matters relating to the supervision of operations.

Sec. 3. Issuance of Mineral Leases, Permits, and Licenses.

(a) Applications. Prior to the issuance of mineral prospecting permits, leases, or licenses, the Bureau of Land Management refers all applications for such permits, leases, or licenses to the Geological Survey for a report as outlined in (b) below.

(1) The Geological Survey is responsible for determining, under the mineral leasing laws and regulations, if sufficient information is known about a mineral deposit to warrant offering the deposit for lease by competitive sale and to notify the Bureau of Land Management of its determination. If the Geological Survey finds that sufficient information is not available to warrant competitive leasing, it notifies the Bureau of Land Management of its conclusions so that the Bureau of Land Management may issue a prospecting permit or noncompetitive lease, as appropriate. The Geological Survey establishes prospecting requirements for prospecting permits. When lands are to be leased, the Geological Survey determines and reports, as appropriate, on: the mineral characteristics of lease and permit areas; parcelling; amounts of bonds; royalties; unit values; rentals; mineral resource evaluations; reserves; investments; diligent development and minimum production requirements; and all other terms and conditions pertaining to lease operations, including environmental and surface rehabilitation stipulations relating to mineral exploration and extraction. With respect to applications for licenses, the Geological Survey determines and reports as to whether the license may be issued.

(2) The Geological Survey is responsible for determining whether a prospecting permittee has demonstrated that the lands contain a mineral deposit having the characteristics required by law and regulations to qualify for a preference right lease and to notify the Bureau of Land Management.

(3) The Bureau of Land Management refers to the Geological Survey all other type applications received which, if approved, may affect operations on existing permits, leases, or licenses.

(4) The Bureau of Land Management notifies the Geological Survey of known oil, gas, and geothermal resource geophysical exploration activity, including the area involved, the type of survey employed, and the name of the operator.

(5) All applications for noncompetitive oil and gas, mineral, and geothermal resource leases filed with the Bureau of Land Management will, prior to issuance of a lease, be referred to the Geological Survey for a determination as to whether the lands are within a known geologic structure (KGS), a known geothermal resource area (KGRA), or a known leasing area (KLA).

(b) Mineral Resource Evaluation Report. GS is responsible for submitting a report of its findings, mineral resource evaluations, and resultant recommendations to the BLM, together with a summary explanation of how the resource evaluations were developed from geophysical, geologic, economic, and engineering data available at the time of the evaluation. The BLM reviews these findings and recommendations in light of multiple-use management requirements and will not issue leases or permits inconsistent with the findings and recommendations without further discussion with GS. If differences remain after further discussion, the resolution is made by the Assistant Secretary--Mineral Resources and the Assistant Secretary--Public Land Management. If required, the Under Secretary resolves any remaining differences.

(c) Competitive Lease Sales. The Bureau of Land Management advertises and conducts competitive lease sales. The Geological Survey's resource evaluations will be used and the Geological Survey will have representatives at the sale and renders a post-sale recommendation to BLM regarding acceptance or rejection of the bids, which must be confirmed in writing.

(d) Files and Records. BLM maintains the official application, permit, and lease case files and forwards to the Geological Survey a copy of each permit, lease, and license, together with copies of relevant correspondence thereafter conducted by the Bureau. The GS forwards to the BLM copies of mining and exploration plan applications, drilling permit applications, and relevant items submitted by the applicants directly to the GS, except confidential proprietary information cited under paragraph (e) below.

(e) Security of Information. The Geological Survey is responsible for receiving and protecting for the confidential use of the Federal Government all proprietary geological, geophysical, engineering, economic, statistical, or other information, mineral resource data, and well logs required to be submitted under Title 30 CFR, Parts 200, 211, 216, 221, 231, 270, and related regulations. The Survey Office receiving such information is designated the Office of Control for those data. Authorized officials of BLM or other surface-managing agencies having a need to see such information will normally make appropriate arrangements to visit the Office of Control for access to such data and for technical advice based on it pertinent to their management responsibilities.

Sec. 4. Mineral Reports. The Geological Survey is responsible for preparing and submitting to the Bureau of Land Management mineral classification and evaluation reports with respect to the leasable mineral value of lands within proposed exchanges, withdrawals, sales, land entries, or other disposals and all other land transactions. The Geological Survey, upon request, also prepares and furnishes mineral reports and other information to the Bureau of Land Management needed for its use in long-range multiple-use planning or inventory of the public lands.

Sec. 5. General Relationships. Such additional references, reports, interchange of information, and advice shall be made by or between the Bureau of Land Management and Geological Survey as may be necessary to perpetuate or improve current practice and provide effective administration of the mineral leasing laws.

The Bureau of Land Management and the Geological Survey must submit to each other for review and recommendations any proposed changes in standard lease terms, regulations, instructions, or other changes that would affect each agency's management responsibilities.

Sec. 6. Implementation of Order. It is intended that there will be no duplication by the BLM or GS of the functions assigned by this Order. BLM and GS will promptly bring their manuals and instructions into agreement with the terms and the spirit and intent of this Order.

Sec. 7. Revocation. The Secretary's instruction (procedures relating to the administration of the mineral leasing laws - General Land Office and Geological Survey) dated September 22, 1925 (51 L. D. 219) is revoked.

OCT - 6 1972

Secretary of the Interior

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